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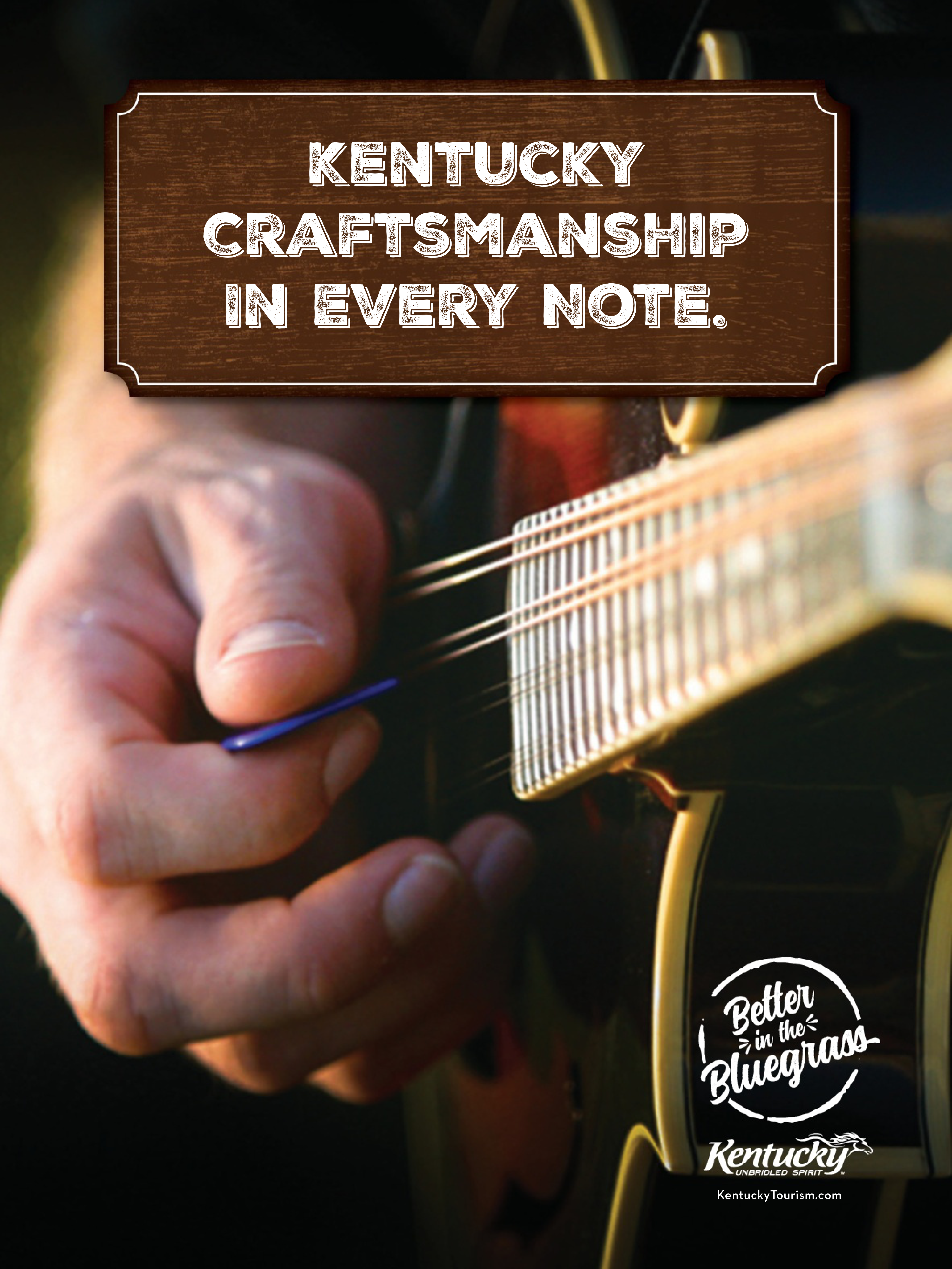
THE NEW POMPEII

MYTH AND MYSTERY AT THE WORLD'S MOST BELOVED RUIN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After 40 years in storage at an Australian university, the skeleton known as Mungo Man—one of the oldest *Homo sapiens* ever found outside Africa—is finally being returned to the Aboriginal people

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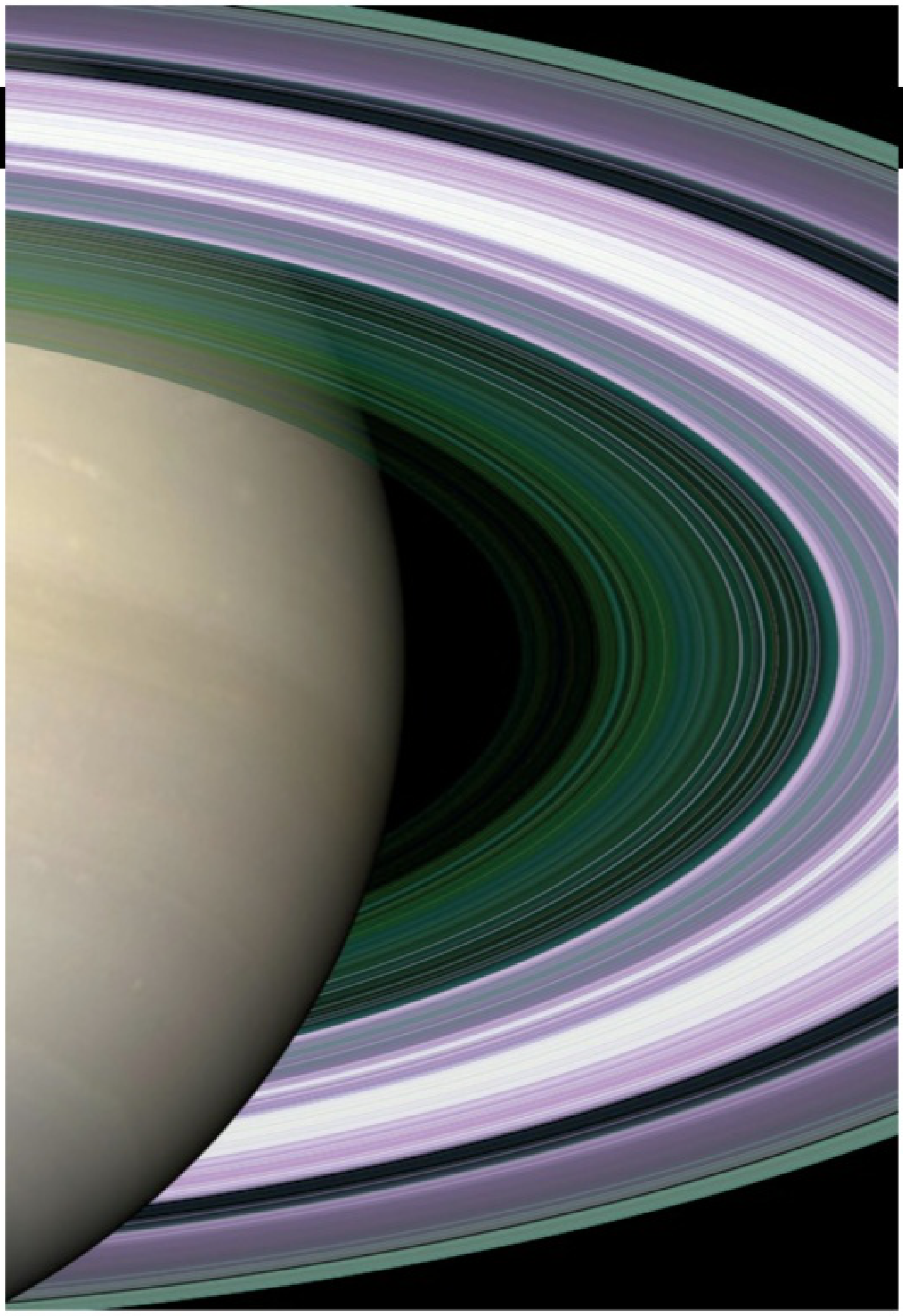

A digitally remastered image of Saturn and its mysterious rings, based on observations by NASA's Cassini spacecraft.

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Made largely of frozen water particles, the planet's massive rings have intrigued astronomers ever since Galileo first spotted them centuries ago. But if startling new observations are correct, their days may be numbered

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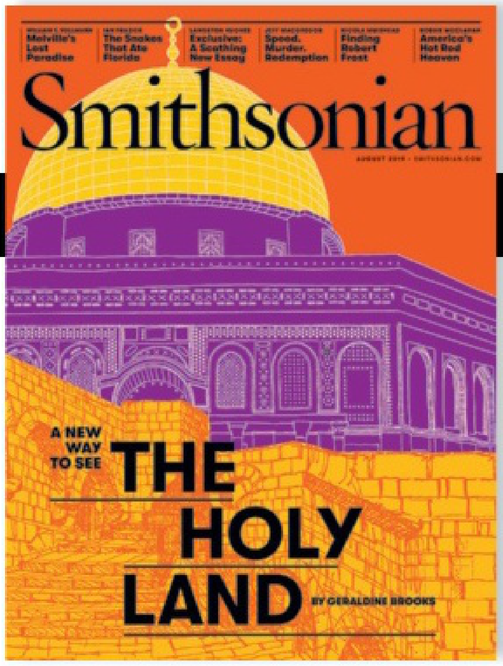
NASA; ALAMY (DETAIL)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A NEW WAY TO SEE THE HOLY LAND
BY GERALDINE BROOKS

FROM THE EDITORS

“VERY RARELY am I compelled to read a magazine cover-to-cover,” a reader named Dave Jemo said of our July-August issue. “But the wide spectrum of well-written articles found me doing just that.” How inspiring of the author William T. Vollmann to retrace Herman Melville’s steps in the South Pacific, Jerry Loeffelbein said: “With new insight I will once again read *Moby-Dick* and likely his other books.” The image of Smokey Bear by the illustrator Corey Schumann prompted speculation he had gone too far in mirroring artwork by Charley Harper. Schumann, though, says he was paying homage to Harper. Our cover story about Holy Land tours led by both Israeli and Palestinian guides provoked the greatest response, stirring passions on all sides of the Mideast conflict. Some readers grumbled about omitted details. Others disputed facts that are, in fact, disputable. And many found that Geraldine Brooks’ carefully reported narrative was, as Theresa Flynn said, “heartening.”

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Building Bridges in the Holy Land

I began reading “A New Way to See the Holy Land” and thought what a wonderful way to tour the area—everyone should strive for a balanced approach. Then I came to the part where it said they were also using this approach in Northern Ireland. My initial thought was, “That’s not right, there are not two sides to that issue.” After a minute, I looked at my initial reaction. In a part of the world where I have no strong feelings about an issue, I was willing to listen to both sides. But in an area where I have strong feelings, I was cutting off any dialogue. It made me question my ability to maintain an open mind—and that’s the best part of any article.

— **Mary Jo McMullen** | Tucson

Having served in Jerusalem with the United Methodist Church, I greatly appreciated Oded, Aziz and Mejdi Tours. As they say, “It’s complicated.” But I’m convinced that authentic peace will not come from the top down but from the ground up. When more Israelis and Palestinians are permitted to hear one another’s desperate stories, walls will start coming down, literally and emotionally, and life will begin to change. I’m grateful to them for educating us and their own people.

— **Rev. Bob Hannum** | Lancaster, Pennsylvania

Moby-Dick, Manifested

About 120 years after Melville set foot on Nuku Hiva, I did likewise in 1965. For days I touched and inhaled what I continue to consider the world’s most beautiful tropical island. You can appreciate the thrill I felt reading your fine article, which revealed much about Melville that I did not know or had forgotten.

— **Barnett L. Cline** | Blanco, Texas

Florida’s Foe

“SnakeLandia” seems to imply that invasive pythons didn’t have a breeding population in Florida before the 1990s. In the mid-1970s, I worked as a journalist near the Everglades. All the Floridians I knew were already aware of a breeding population of Burmese pythons. May I suggest the current seriousness of the problem is a direct result of Florida state agencies refusing to believe the first reports by Floridians nearly half a century ago?

— **Trish Johnson** | Katy, Texas

Corrections: “Inside America’s Greatest Adventure” (June) noted that Neil Armstrong said, “The Eagle has wings” after blasting off from the Moon. In fact, he uttered the phrase just after the lunar module began its descent to the Moon.

In “Return to the Titanic” (June), we stated that Robert Ballard discovered the wreck. In fact, it was a joint effort by Ballard and Jean-Louis Michel.

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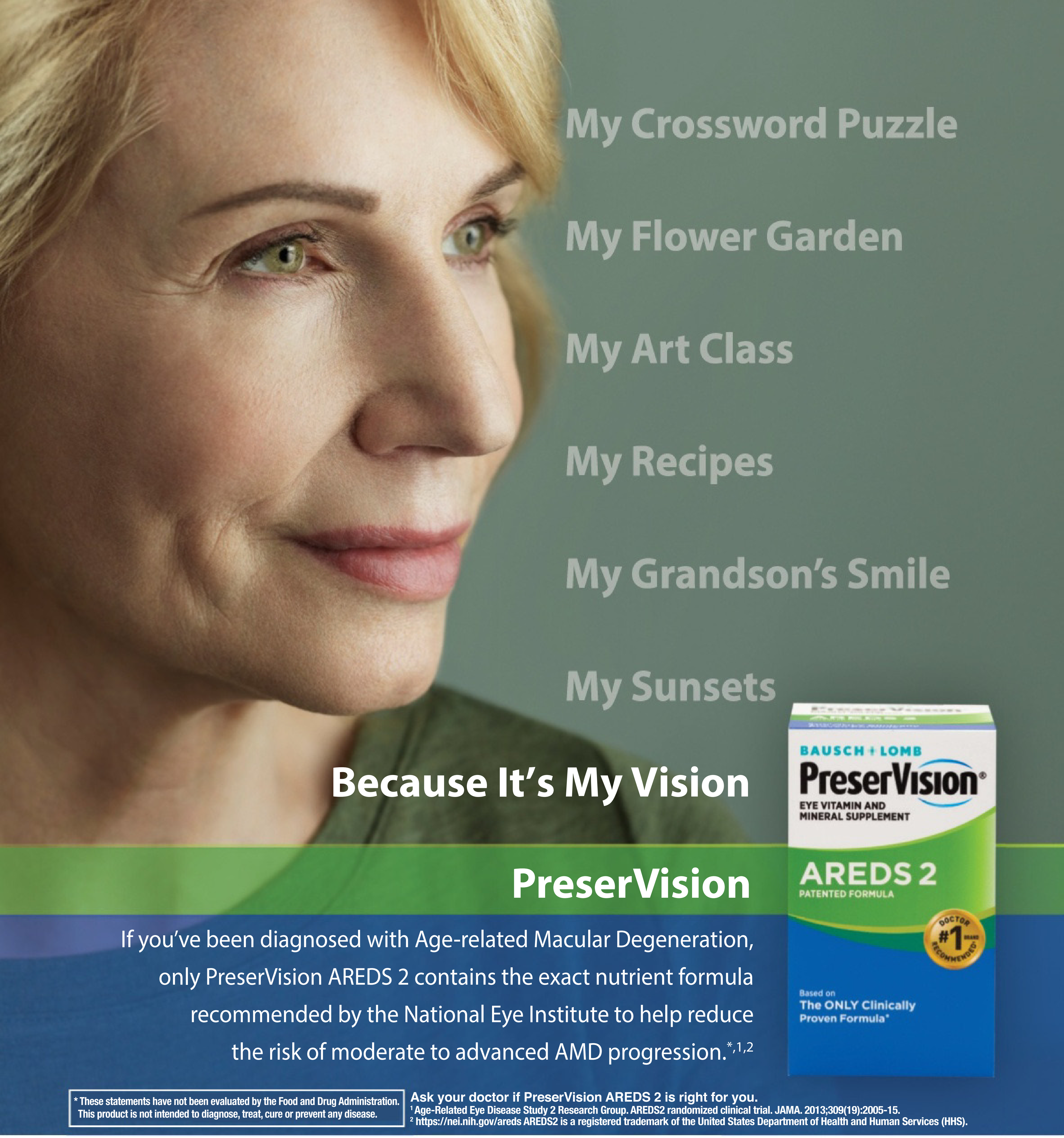
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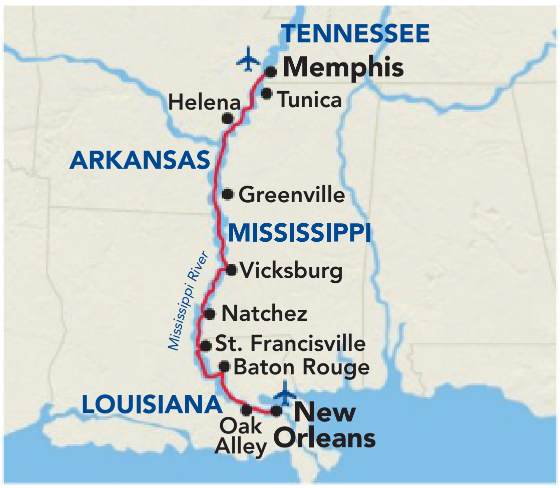
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By
Gabriella M. Petrick

Life of Pie

How did a humble dessert become a recipe for democracy?

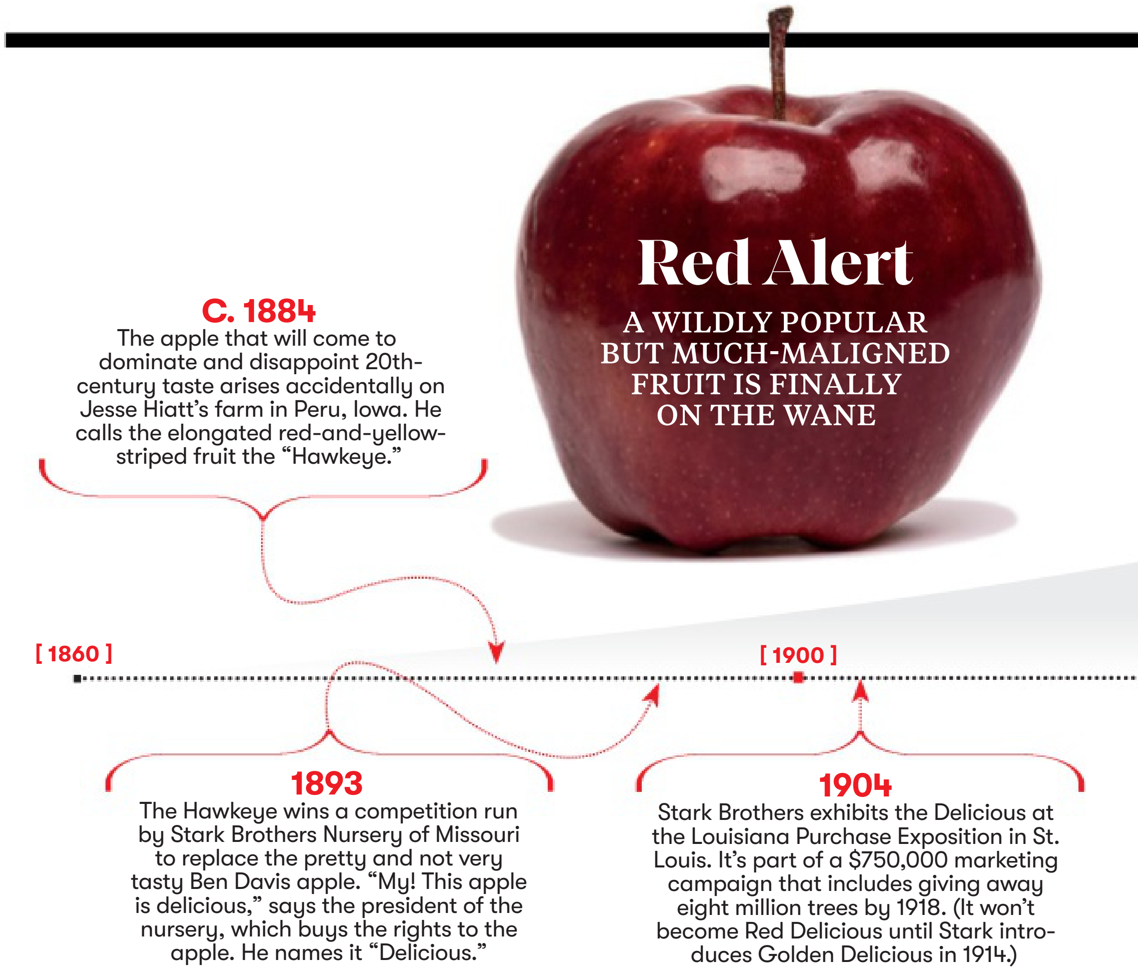
AMERICAN ICON

By mid-century, pie was big business. Demand was highest on Thanksgiving, Christmas and Washington's Birthday.

IN THE EARLY 1900s, the United States was at war—over pie. On one side were the traditionalists, who saw pie as "an article of necessity in every household as much as the bed and cook stove," according to a *Chicago Daily Tribune* report in 1899. On the other side were the food reformers, who wanted to break this unhealthy and corrupting habit. "Pie really is an American evil," Kate Masterson wrote in the *New York Times* in 1902. It is an "unmoral food," she warned, offering advice for spotting pie eaters: They have "sallow complexions" and "lusterless or unnaturally bright eyes" and, of course, they "are all dyspeptic." "No great man," she wrote, "was ever fond of pie."

Those were fighting words. Pie eaters traced their love of the dish back to the founding fathers—a particular pumpkin pie recipe credited to the Adams family was said by the *Kansas City Star* to have "raised a well-fed race of jurists, scholars, orators and Presidents"—and still further back to the Massachusetts Bay Colony. The pie tradition of the New England colonies had come from old England with the settlers, who transformed the savory kidney and mincemeat pies of the British Isles into sweet pies filled with fruits that grew well along the Atlantic Coast. The crusts changed, too. They were lighter and flakier because lard from pigs was more abundant in the Colonies than tallow from cows. (Sugar and spices were imported to the Colonies from Britain, which controlled most trade.) In 1892, Rudyard Kipling described the Northeast as "the great American pie belt," a title that traditionalists claimed proudly. As the population moved west, the pie recipes did, too.

By the turn of the century, Americans were eating more apple pie than any other variety. Apples, first brought to the continent by the colonists, grew well across large swaths of the country and could be stored through the winter, unlike most other fresh fruits. The phrase "as American as apple pie" would not be coined until a 1924 advertisement in the Gettysburg, Pennsylvania, *Times* for men's suits that bucked English fashion trends. But the idea was already so deeply ingrained that pie eating became a way for the country's newest arrivals—now mainly from Central, Southern and Eastern Europe—to assimilate. "Every American is born with an appetite



Red Alert

A WILDLY POPULAR BUT MUCH-MALIGNED FRUIT IS FINALLY ON THE WANE

C. 1884
The apple that will come to dominate and disappoint 20th-century taste arises accidentally on Jesse Hiatt's farm in Peru, Iowa. He calls the elongated red-and-yellow-striped fruit the "Hawkeye."

1893
The Hawkeye wins a competition run by Stark Brothers Nursery of Missouri to replace the pretty and not very tasty Ben Davis apple. "My! This apple is delicious," says the president of the nursery, which buys the rights to the apple. He names it "Delicious."

1904
Stark Brothers exhibits the Delicious at the Louisiana Purchase Exposition in St. Louis. It's part of a $750,000 marketing campaign that includes giving away eight million trees by 1918. (It won't become Red Delicious until Stark introduces Golden Delicious in 1914.)

P.7: ALAMY; ISTOCK; SHUTTERSTOCK (4); THIS SPREAD: GETTY; ALAMY; SHUTTERSTOCK

for pie,” a New York newspaper opined in 1895. As for the immigrant, the paper wrote, “his Americanism, in fact, may be tested in his taste for pie.”

To the growing food reform movement, though, pie was a remnant of our rustic past, before the United States had taken its place on the international stage. Advocates such as Harvey Wiley—now best known for his support of the Pure Food and Drug Act of 1906—called for a simpler and lighter diet, focused on Northern European cuisines. Pie eaters (code for immigrants and the lower classes, in the language of the food reformers) were a drag on society. Elizabeth Fulton, a home economist at Kansas State Normal School, believed pie eating, like alcoholism, was a cause of divorce. She implored homemakers to “return to fresh fruit.”

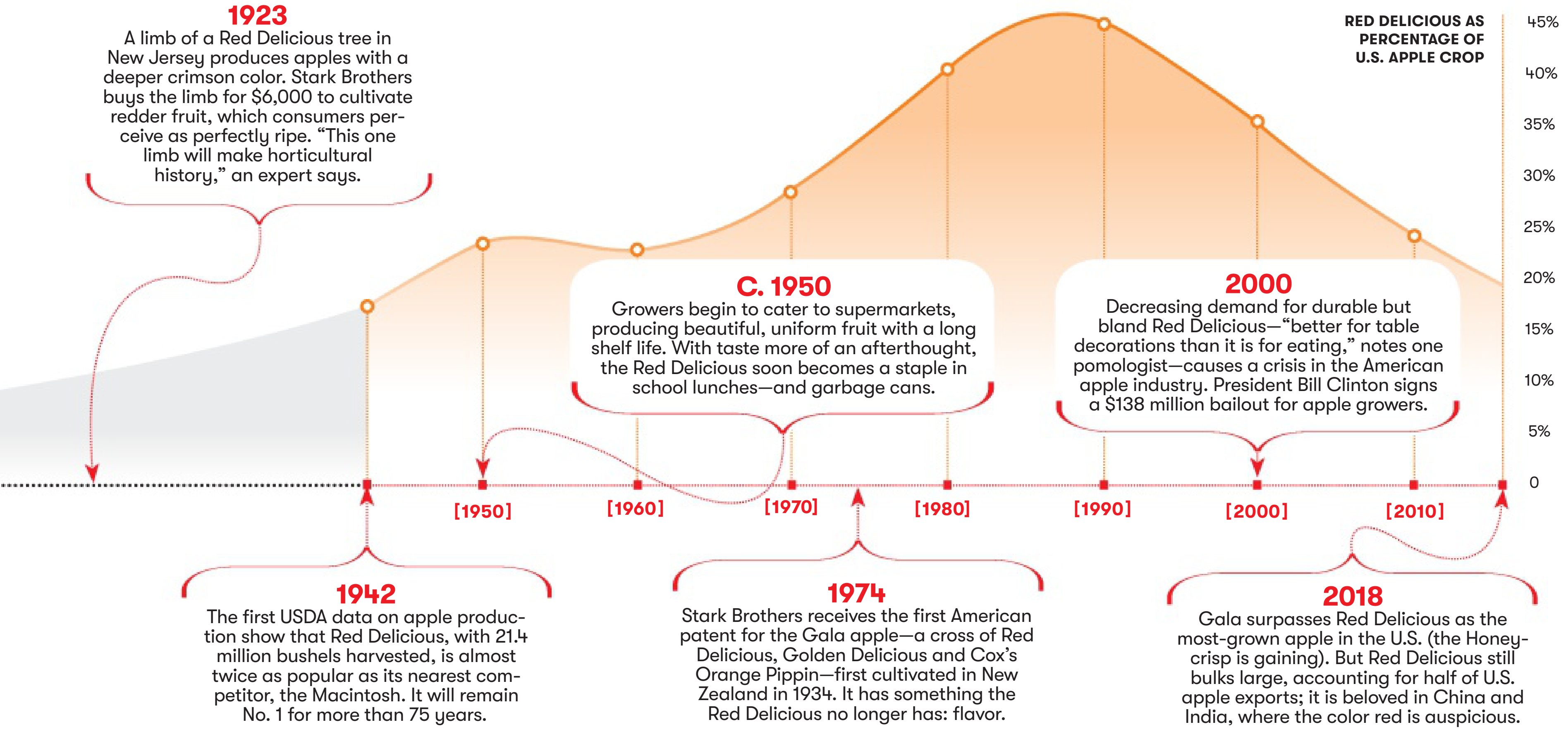
> **“PATRICK HENRY MIGHT AS WELL HAVE SAID ‘GIVE ME PIE OR GIVE ME DEATH’ BECAUSE WHAT IS LIBERTY WITHOUT PIE?”**

The reformers might have won the battle, too, if not for the outbreak of World War I. Now pie eating was patriotic. “As soon as an American boy goes to any foreign country he at once begins to languish for American pie,” a *Boston Daily Globe* editorial professed in 1918. The craving, the *Globe* wrote, was a hunger for democracy itself: “Patrick Henry might as well have said ‘Give me pie or give me death’ because what is liberty without pie?”

It maintained its symbolic significance into the Cold War. When Soviet Premier Nikita Khrushchev visited New York City in the fall of 1960 to address the United Nations, a woman named Virginia McCleary sent a package from her Texas home to Khrushchev’s residence on Park Avenue. The bomb squad was called to examine the five-pound delivery. Inside was an apple pie. The pastry, McCleary said, would introduce Khrushchev to American values: “The Communist pie is nothing but crust. In America we have an upper crust and a lower crust but it’s what’s between—the middle class—that gives the real flavor.”

Today apple pie tastes like nostalgia, as in the unforgettable (try as one might) 1974 General Motors jingle “Baseball, hot dogs, apple pie and Chevrolet, they go together in the good ol’ USA.” The company revived it in 2012 as the nation emerged from the financial crisis and the lingering menace of 9/11.

Despite the current fad for locally grown fresh foods that are low carb, keto-friendly and gluten-free, we still have a soft spot for this classic dessert: About 186 million pies of all sorts are purchased every year at the nation’s grocery stores alone. The ingredients have evolved over the years in step with waves of immigrants—think mango, Asian pear and banana split—but America’s undisputed favorite is still apple pie.



1923
A limb of a Red Delicious tree in New Jersey produces apples with a deeper crimson color. Stark Brothers buys the limb for $6,000 to cultivate redder fruit, which consumers perceive as perfectly ripe. “This one limb will make horticultural history,” an expert says.

C. 1950
Growers begin to cater to supermarkets, producing beautiful, uniform fruit with a long shelf life. With taste more of an afterthought, the Red Delicious soon becomes a staple in school lunches—and garbage cans.

2000
Decreasing demand for durable but bland Red Delicious—“better for table decorations than it is for eating,” notes one pomologist—causes a crisis in the American apple industry. President Bill Clinton signs a $138 million bailout for apple growers.

1942
The first USDA data on apple production show that Red Delicious, with 21.4 million bushels harvested, is almost twice as popular as its nearest competitor, the Macintosh. It will remain No. 1 for more than 75 years.

1974
Stark Brothers receives the first American patent for the Gala apple—a cross of Red Delicious, Golden Delicious and Cox’s Orange Pippin—first cultivated in New Zealand in 1934. It has something the Red Delicious no longer has: flavor.

2018
Gala surpasses Red Delicious as the most-grown apple in the U.S. (the Honeycrisp is gaining). But Red Delicious still bulks large, accounting for half of U.S. apple exports; it is beloved in China and India, where the color red is auspicious.

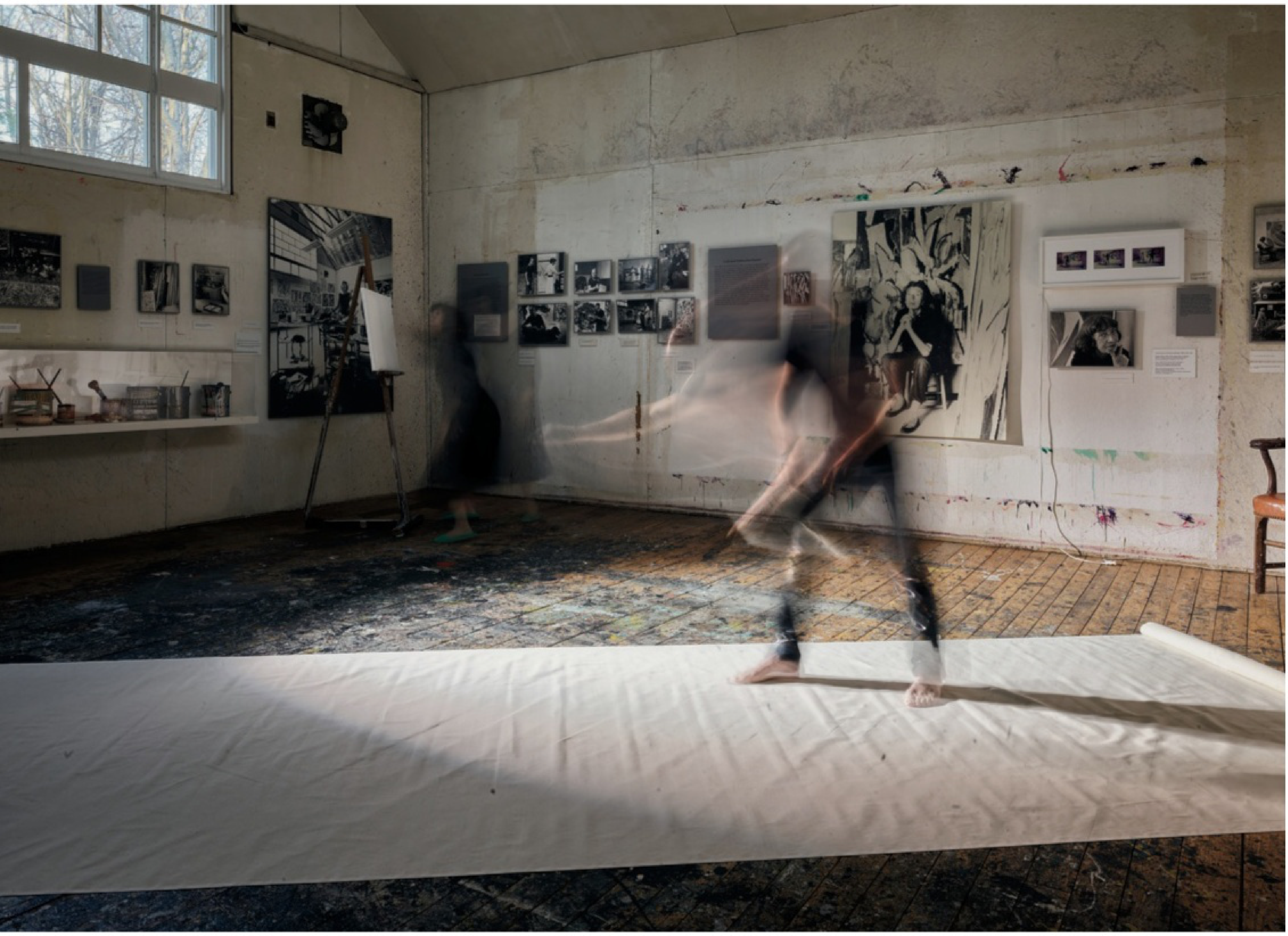
Research by **Matthew Browne**

ART

By
Amy Crawford

BREATHING ROOMS

Dramatic new photographs bring acclaimed artists back to life



"The paint went all over, and of course some of it went off the canvas," the photographer says of Pollock's technique, re-enacted here in his studio.

WHEN ADRIEN BROOM first visited the former Long Island home of Jackson Pollock and his wife, the painter Lee Krasner, she was transfixed by the splattered floorboards in Pollock's studio, a relic of the modernist's signature technique. "You see the borders of some of the most famous works to come out of America," Broom says, "and they all merge together to create something so special that is only in this one place." Conjuring such moments for her photography series *Holding Space*, Broom recruits actors to imagine life in richly suggestive historic dwellings, such as those of Mark Twain, the arts patron Florence Griswold and the photographer Alice Austen. Seeing their quotidian belongings humanizes their one-time occupants. "These people have become legendary—godlike," she says. "But here is a bedroom with a tiny little bed, and this is their bathroom! It's inspirational because they created wonderful work, but they were still just people."◆

ADRIEN BROOM

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There's More to Explore in Taiwan

National Palace Museum

When most people think of traveling to Taiwan, images of breathtaking Sun Moon Lake or the towering Taipei 101 skyscraper come to mind. While these destinations are iconic for a reason, there is so much more to discover on the island. In particular, Taiwan is home to a myriad of museums that offer a window into its diverse cultures, rich history and natural heritage. Whether exploring the world's largest collection of Chinese artifacts in Taipei City or discovering a lesser-known craft museum in the countryside, Taiwan's museum network has something for every traveler.

City Attractions

Begin your cultural journey in Taipei City with a tour of Taiwan's ***National Palace Museum***. Built in the architectural style of a Chinese palace, the museum houses more than 600,000 artifacts spanning several thousand years of Chinese history. ***The National Museum of Natural Science***, located in the heart of Taichung City, is another must-see destination. Be sure to wear your walking shoes to visit the museum, as it spans 22 acres and consists of five venues: the Space IMAX Theater, Science Center, Life Science Hall, Human Cultures Hall, Botanical Garden and Global Environment Hall.

Small-Town Sights

Just 30 minutes from the center of Taipei City, the bubbling mineral waters and green mountains of Beitou greet travelers looking for a restorative getaway. While you're there, stop into the ***Beitou Hot Spring Museum***, a restored bathhouse from the Japanese Colonial Era, to learn about the history of Beitou's hot spring spas.

Outside of Taichung City, don't miss the small town of Sanyi, also known as Taiwan's Woodcarving Kingdom. The ***Sanyi Wood Sculpture Museum***, a quick taxi ride from the Sanyi Train Station, displays a rotating collection of awe-inspiring carvings and tells the story of how wood sculpture evolved from one man's hobby into a cultural and commercial mainstay of the town over the course of the 20th century. •

Sanyi Wood Sculpture Museum

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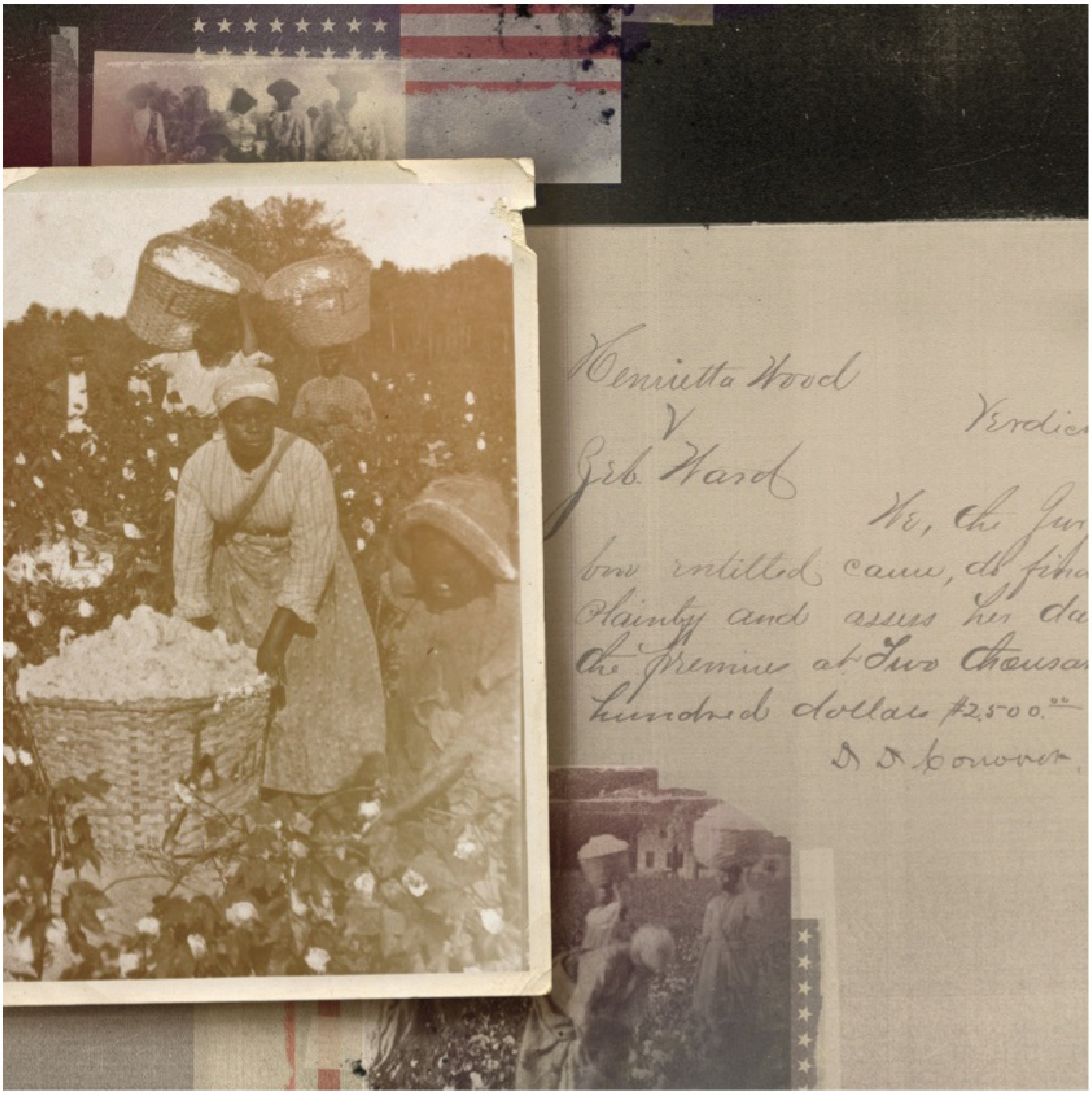
JUSTICE

By
W. Caleb McDaniel

Illustration by
Cliff Alejandro


Henrietta Wood
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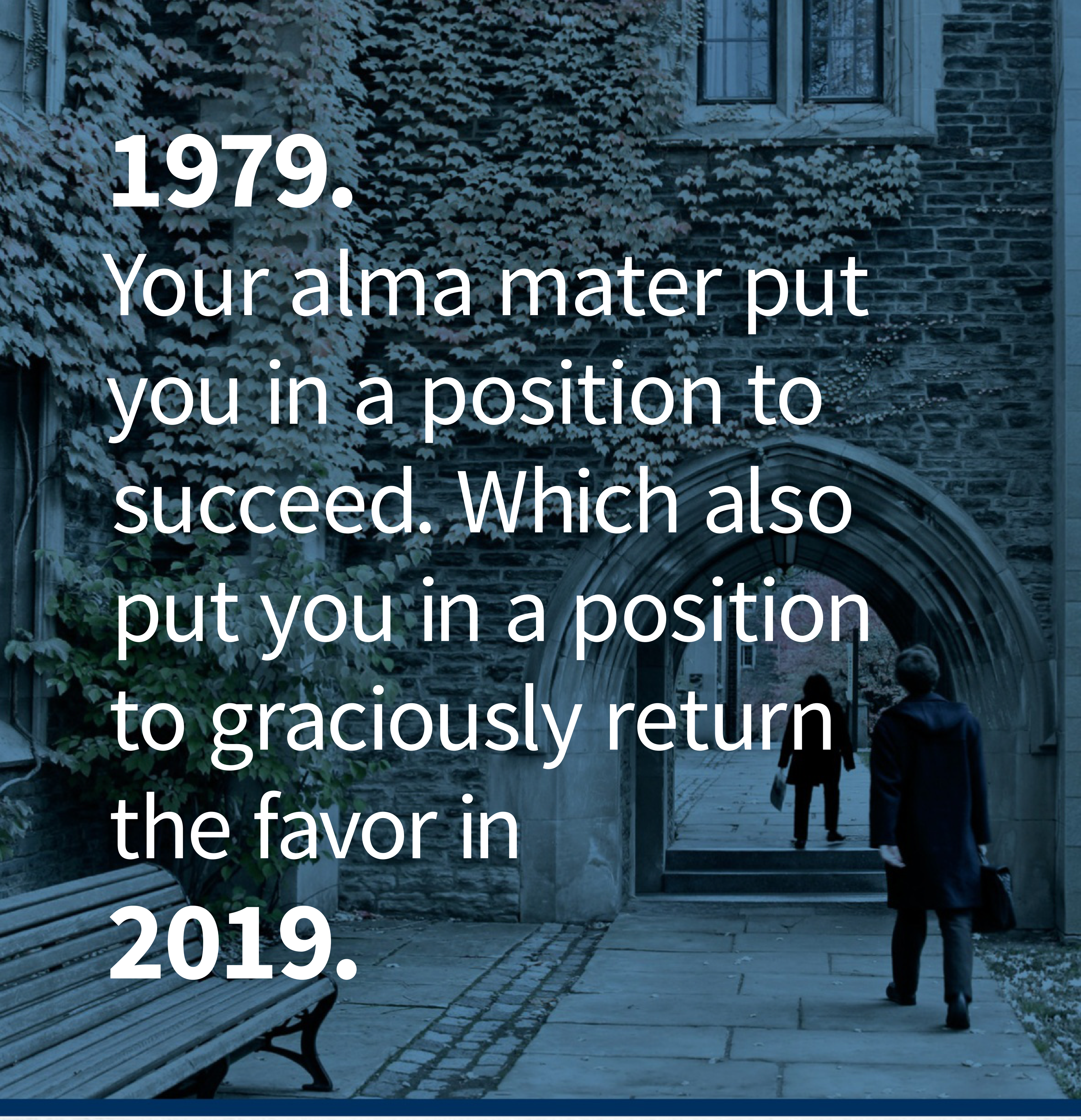
SOURCE MATERIAL: W. CALEB MCDANIEL; NYPL (3)

No image of Henrietta Wood survives today, but her story is recorded in court filings, including the verdict slip above.

The Nation's Unsettled Account

In 1870 Henrietta Wood sued for reparations—and won the largest verdict ever awarded for slavery

ON APRIL 17, 1878, twelve white jurors entered a federal courtroom in Cincinnati, Ohio, to deliver the verdict in a now-forgotten lawsuit about American slavery. The plaintiff was Henrietta Wood, described by a reporter at the time as "a spectacled negro woman, apparently sixty years old." The defendant was Zebulon Ward, a white man who had enslaved Wood 25 years before. She was suing him for $20,000 in reparations. Two days earlier, the jury had watched as Wood took the ➲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stand; her son, Arthur, who lived in Chicago, was in the courtroom. Born into bondage in Kentucky, Wood testified, she had been granted her freedom in Cincinnati in 1848, but five years later she was kidnapped by Ward, who sold her, and she ended up enslaved on a Texas plantation until after the Civil War. She finally returned to Cincinnati in 1869, a free woman. She had not forgotten Ward and sued him the following year.

The trial began only after eight years of litigation, leaving Wood to wonder if she would ever get justice. Now, she watched nervously as the 12 jurors returned to their seats. Finally, they announced a verdict that few expected: “We, the Jury in the above entitled cause, do find for the plaintiff and assess her damages in the premises at Two thousand five hundred dollars.”

Though a fraction of what Wood had asked for, the amount would be worth nearly $65,000 today. It remains the largest known sum ever granted by a U.S. court in restitution for slavery.

But Wood’s name never made it into the history books. When she died in 1912, her suit was already forgotten by all except her son. Today, it remains virtually unknown, even as reparations for slavery are once again in the headlines.

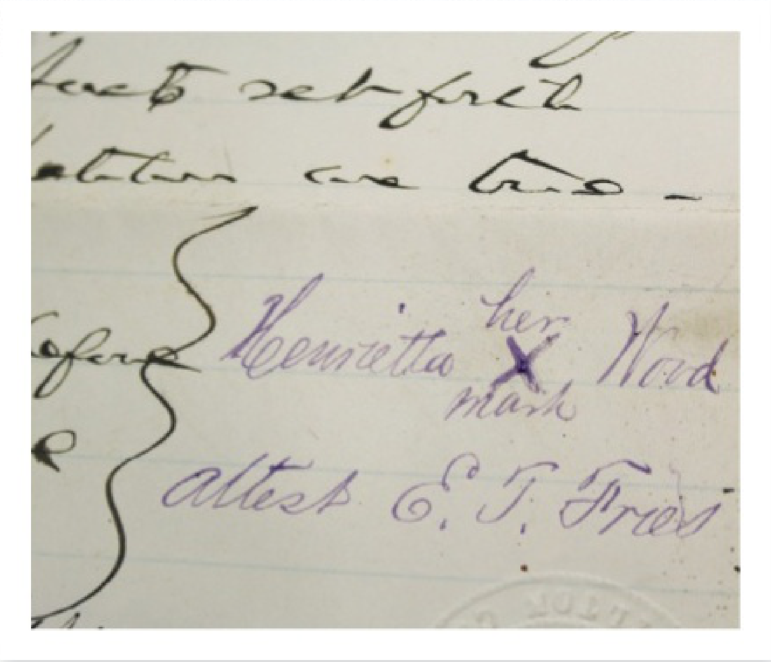
I first learned of Wood from two interviews she gave to reporters in the 1870s. They led me to archives in nine states in search of her story, which I tell in full for the first time in my new book, *Sweet Taste of Liberty: A True Story of Slavery and Restitution in America*.

HENRIETTA WOOD’S STORY began two centuries ago with her birth in northern Kentucky.

“I can’t quite tell my age,” Wood recalled in a newspaper interview in 1876, but she knew she was born enslaved to the Tousey family between 1818 and 1820. In 1834, the teenager was bought by a merchant in Louisville and taken from her family. She was soon sold again, to a French immigrant, William Cirode, who took her to New Orleans.

“ MY MISTRESS GAVE ME MY FREEDOM AND MY PAPERS WERE RECORDED. ”

Cirode returned to France in 1844, abandoning his wife, Jane, who eventually took Wood with her to Ohio, a free state. Then, in 1848, Jane Cirode went to a county courthouse and registered Wood as free.



set free

are true –

Henrietta her X mark Wood

attest E. T. Fries

▲ Brandon Hall, where Wood toiled as a slave in the 1850s, as it looked in 1936. Right, Wood’s mark on an affidavit from *Wood v. Ward*.

TOP: LIBRARY OF CONGRESS; BOTTOM: W. CALEB MCDANIEL

“My mistress gave me my freedom,” Wood later said, “and my papers were recorded.” Wood spent the next several years performing domestic work around Cincinnati. She would one day recall that period of her life as a “sweet taste of liberty.”

All the while, however, there were people conspiring to take her freedom away. Cirode’s daughter and son-in-law, Josephine and Robert White, still lived in Kentucky and disagreed with Jane Cirode’s manumission of Wood; they viewed her as their inheritance. By the 1850s, the interstate slave trade was booming, and the Whites saw dollar signs whenever they thought of Wood. All they needed was someone to do the dirty work of enslaving her again.

Zebulon Ward was their man. A native Kentuckian who had recently moved to Covington, just across the Ohio River from Cincinnati, Ward became a deputy sheriff in 1853. The Whites lived in Covington, too, and in the spring of 1853 they convinced Ward to pay them $300 for the right to sell Wood and pocket the proceeds himself—provided he could get her.

Gangs worked throughout the antebellum period to capture free black men, women and children and ➔

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smuggle them into the South, under the cover of the Fugitive Slave Law of 1850, which required the return of runaway slaves. Ward began to plot with a group of these notorious “slave catchers.” The gang located Wood’s employer in Cincinnati, a boardinghouse keeper named Rebecca Boyd, and paid her to join their scheme. One Sunday afternoon in April 1853, Boyd tricked Wood into taking a carriage ride across the river. And when the carriage finally rolled to a stop outside of Covington, Ward’s men were waiting.

It would be 16 years before Wood set foot in Ohio again.

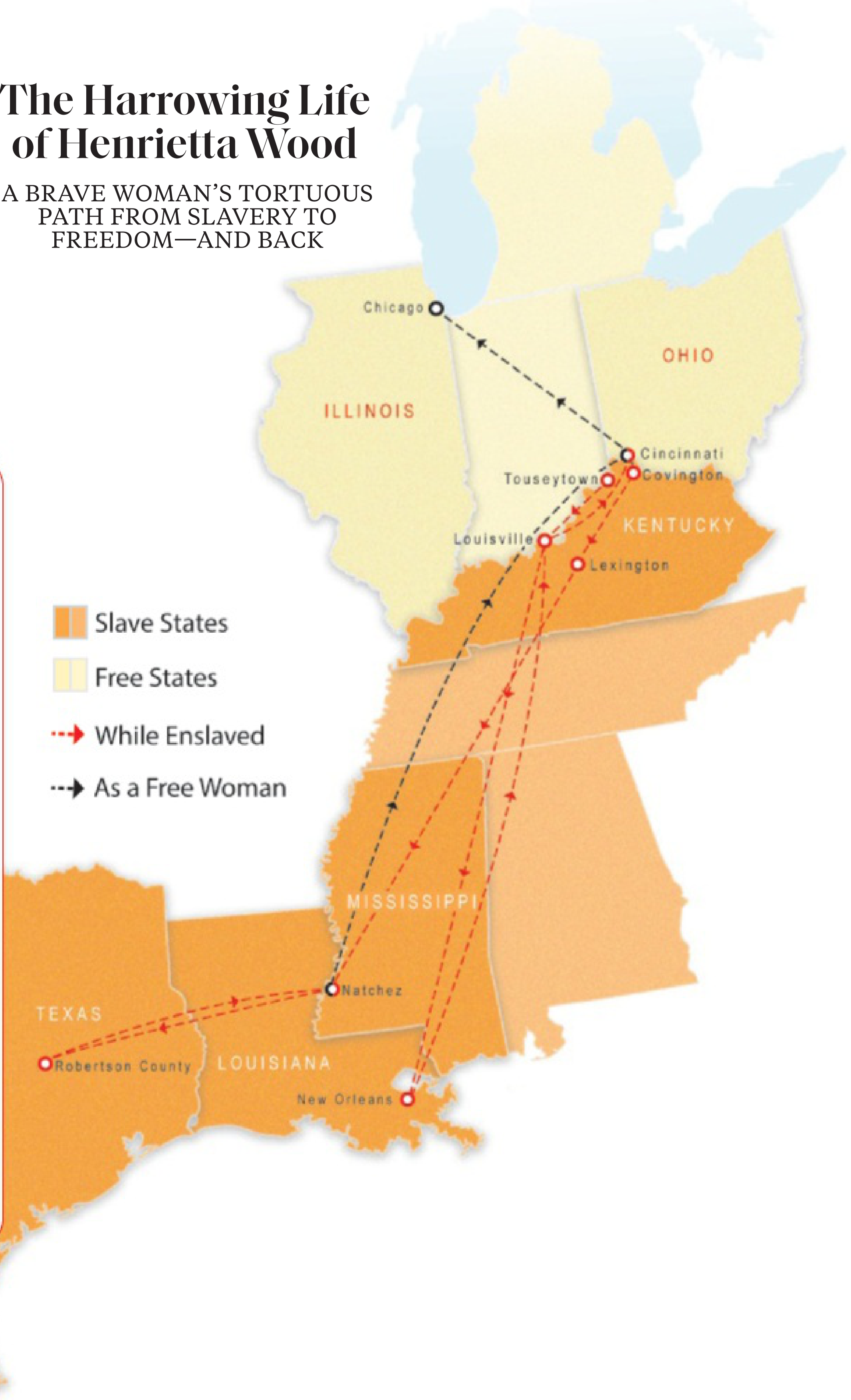
She spent the first nights of her captivity locked inside two roadside inns. Her captors’ destination was Lexington, Kentucky, where prices for slaves had risen in tandem with the Southern cotton economy. After 1815, as white settlers rushed into the lower Mississippi River Valley, many looked to purchase slaves to cultivate the region’s most profitable crop. Slave traders met the demand by buying slaves in Virginia, Kentucky and Maryland and selling them in the cotton states. Between 1820 and 1860, nearly one million people were sold “down the river.”

Ward planned to make Wood the latest victim of this trade, but she resolved to fight. Wood secretly told her story to a sympathetic innkeeper who followed her to Lexington, where a lawsuit was filed on her behalf asserting that she was free. Wood was never allowed to testify, however, and Ward denied her claims. Her official freedom papers, at a courthouse in Cincinnati, had been destroyed in an 1849 fire, and her kidnappers had confiscated her personal copy. The case was eventually dismissed. In the eyes of Kentucky law, Wood was a slave.

The freedom suit had prevented Ward from selling Wood for nearly two years, but in 1855, he took her to a Kentucky slave-trading firm that did business in Natchez, Mississippi. The traders put Wood up for sale at Natchez’s infamous Forks of the Road slave market. Gerard Brandon, one of the largest slaveholders in the South, bought Wood and took her to his house, Brandon Hall, on the Natchez Trace. “Brandon was ➔

The Harrowing Life of Henrietta Wood

A BRAVE WOMAN’S TORTUOUS PATH FROM SLAVERY TO FREEDOM—AND BACK



C. 1820
TOUSEYTOWN, KENTUCKY
Wood is born enslaved to the Tousey family.

1834
LOUISVILLE
Henry Forsyth purchases Wood, separating her from her family.

1837-1838
NEW ORLEANS
William Cirode buys Wood and moves her to Louisiana.

1844
LOUISVILLE
Jane Cirode, William’s wife, takes Wood to Kentucky.

1847-1848
CINCINNATI
Jane Cirode takes Wood to Ohio, registers her as free.

1853
COVINGTON, KENTUCKY
Zebulon Ward kidnaps and re-enslaves Wood.

1854
LEXINGTON
Wood loses a lawsuit for her freedom.

1855
NATCHEZ, MISSISSIPPI
Gerard Brandon purchases Wood, forces her to work in the fields.

1863
ROBERTSON COUNTY, TEXAS
Brandon flees to Texas with some 300 slaves, including Wood and her son, after the Emancipation Proclamation.

1866
NATCHEZ
Wood returns with Brandon and gains her freedom.

1869-1870
CINCINNATI
Wood moves to Ohio and files a lawsuit against Ward.

1912
CHICAGO
Wood dies at about age 92.

MAP: ERITREA DORCELY

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a very rich man," Wood later said. He owned 700 to 800 slaves on several plantations, and he "put me to work at once in the cotton field," she said. "I sowed the cotton, hoed the cotton, and picked the cotton. I worked under the meanest overseers, and got flogged and flogged, until I thought I should die."

> **"I WORKED UNDER THE MEANEST OVERSEERS, AND GOT FLOGGED AND FLOGGED UNTIL I THOUGHT I SHOULD DIE."**

At some point during those hellish days, Wood gave birth to Arthur, whose father is unknown. She was later removed from the cotton fields and put to work in Brandon's house.

The Civil War began, followed in 1863 by the Emancipation Proclamation, but Wood's ordeal continued. On July 1, 1863, just days before the U.S. Army arrived to free thousands of people around Natchez, Brandon, determined to defy emancipation, forced some 300 slaves to march 400 miles to Texas, far beyond the reach of federal soldiers. Wood was among them. Brandon kept her enslaved on a cotton plantation until well after the war. Even "Juneteenth," the day in June 1865 when Union soldiers arrived in Texas to enforce emancipation, did not liberate Wood. It wasn't until she returned to Mississippi with Brandon in 1866 that she gained her freedom; she continued to work for Brandon, now promised a salary of $10 a month, but she would say she was never paid.

It was four years after the Confederate surrender before Wood was able to return up the river, where she tried to locate long-lost members of her family in Kentucky. Whether she succeeded in that quest is unknown—but she did find a lawyer, Harvey Myers. He helped Wood file a lawsuit in Cincinnati against Ward, now a wealthy man living in Lexington. The postwar constitutional amendments that abolished slavery and extended national citizenship to ex-slaves enabled Wood to pursue Ward in federal court.

Ward's lawyers stalled, claiming that her failed an-

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tebellum suit for freedom proved his innocence. They also said that Ward's alleged crimes had occurred too far in the past—a recurring argument against reparations. Wood suffered another, unexpected setback in 1874 when her lawyer was murdered by a client's husband in an unrelated divorce case. Then, in 1878, jurors ruled that Ward should pay Wood for her enslavement.

A record now at the National Archives in Chicago confirms that he did, in 1879.

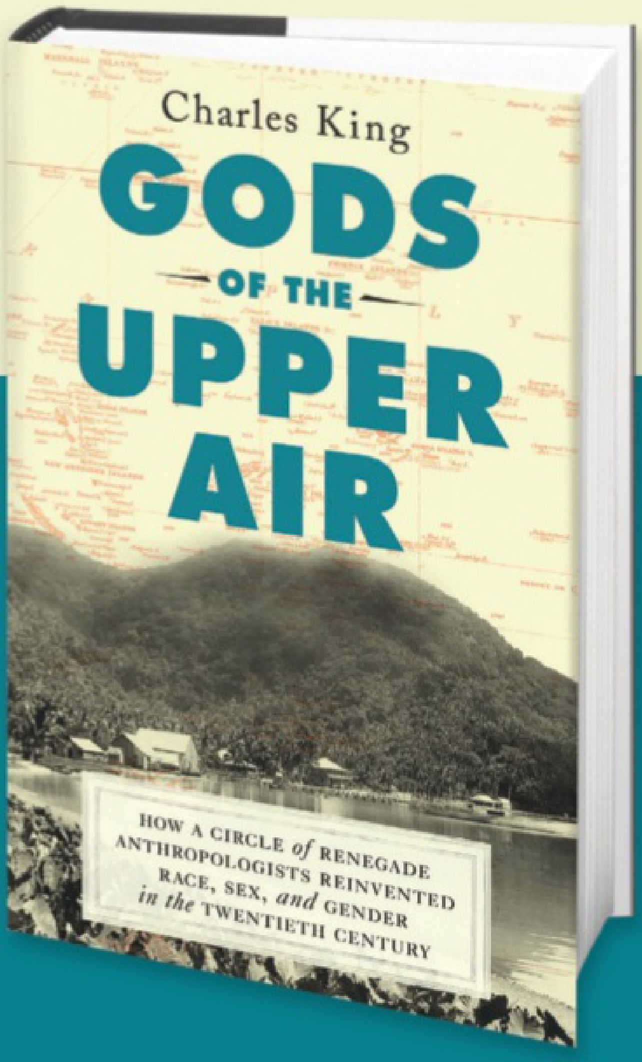
Arthur H. Simms, Wood's son, photographed in 1883 or 1884, at about age 27.

DAVID M. BLACKMAN

WOOD'S VICTORY BRIEFLY MADE her lawsuit national news. Not everyone agreed with the verdict, but the facts of her horrific story were widely accepted as credible. The *New York Times* observed, "Files of newspapers of the five years following the passage of the Fugitive Slave Law are filled with stories of the kidnapping of free men in free States." (In fact, free black Northerners had been kidnapped for years before the Fugitive Slave Law of 1850.) Some newspapers even predicted that lawsuits like hers would proliferate. As one put it, Wood's award was "not a liberal equivalent for the loss of liberty" she had suffered, but it would "be applicable to a great many cases yet untried."

Yet *Wood v. Ward* did not set a sweeping legal precedent. Because the award was small, procedural rules prevented Ward from appealing to higher courts where the verdict might have been more widely noticed. Even the judge who presided over Wood's case, Phillip Swing, viewed it narrowly. "Fortunately for this country the institution of slavery has passed away," he had instructed the jurors, "and we should not bring our particular ideas of the legality or morality of an institution of that character into Court or the jury-box." He had cautioned the jurors against an excessive award, claiming—falsely—that many former slaveholders already regretted slavery.

Swing also told the jurors to focus on Wood's kidnapping in assessing the case, and the vast majority of freed people could not show, as Wood did, that they had been re-enslaved. But Wood and her lawyers had argued that the case was about much ➔


Charles King
GODS
OF THE
UPPER
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HOW A CIRCLE of RENEGADE ANTHROPOLOGISTS REINVENTED RACE, SEX, and GENDER in the TWENTIETH CENTURY

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more than damages from abduction. By suing Ward for the wages she had lost while owned by Brandon, her lawyers made clear that a verdict for Wood was an acknowledgment of the evils of slavery itself.

Few white Americans wished to dwell on those evils. By 1878, white Northerners were retreating from Reconstruction. Many newspapers described Wood's suit as an "old case" or a "relic of slavery times," consigning stories like hers to a fading past. "Not so many complications of a legal nature arise out of the old relations of master and slave as might have been expected," the *New York Tribune* argued with barely concealed relief.

Wood was an early contributor to a long tradition of formerly enslaved people and their descendants demanding redress. In the 1890s another formerly enslaved woman, Callie House, led a national organization pressuring the government for ex-slave pensions. In 1969, civil rights leader James Forman issued a manifesto calling on churches and synagogues to pay half a billion dollars in reparations to black Americans. Today, many reparations advocates look to legislation, targeting governments for their complicity in slavery and white supremacy. They note that disfranchisement and segregation only worsened the racial wealth gap, which was established under slavery and remains today. While Wood received $2,500 as compensation for more than 16 years of unpaid labor, her former enslaver, Ward, left an estate worth at least $600,000 when he died in 1894, a multimillionaire in today's terms.

But Wood's award, however insufficient, was not ineffectual. After her suit, she moved with her son to Chicago. With help from his mother's court-ordered compensation, Arthur bought a house, started a family and paid for his own schooling. In 1889, he was one of the first African-American graduates of what became Northwestern University's School of Law. When he died in 1951, after a long career as a lawyer, he left behind a large clan of descendants who were able to launch professional careers of their own, even as redlining and other racially discriminatory practices put a chokehold on the South Side neighborhoods where they lived. For them, the money Henrietta Wood demanded for her enslavement made a long-lasting difference. ◆

Literature

How to Read Like Mark Twain

STEP ONE: PRETEND YOU DON'T LIKE BOOKS

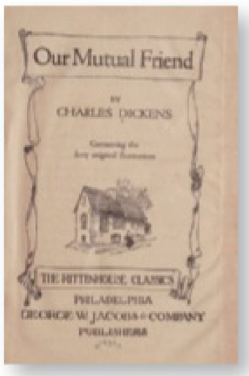
By **Terena Bell**

"I have no liking for novels or stories," Mark Twain once wrote—and often repeated.

You'd have to be as gullible as the boys who whitewashed Tom Sawyer's fence to believe the famous writer didn't read, but the 19th-century literati still fell for it, dismissing Twain as unsophisticated. "Even today there are those who look down their nose at Twain as an unrefined upstart," says Alan Gribben, a professor at Auburn University.

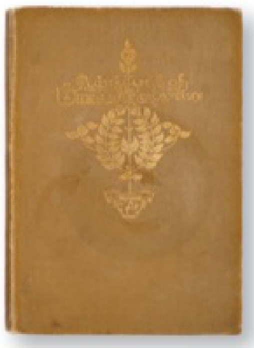
In truth, Twain was a voracious reader, and Gribben has spent almost 50 years compiling a list of the 3,000 books in Twain's library, which was scattered after his death. The scholar has also zeroed in on hundreds of works that influenced Twain's writing, including these titles:

MOST OF CHARLES DICKENS



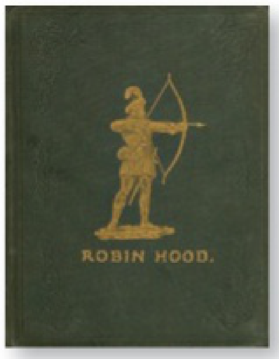
"My brother used to try to get me to read Dickens, long ago," Twain said the year before his death. "I couldn't do it." Actually, young though, young Twain knew some Dickens novels by heart. Echoes of *Our Mutual Friend* can be found in *Adventures of Huckleberry Finn.*

ASTRONOMY BOOKS



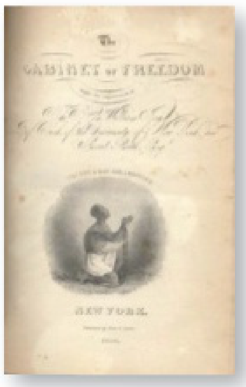
Gribben says Twain "read and annotated every popular book published on astronomy"—and it shows in works such as his *Captain Stormfield's Visit to Heaven.* Twain was also inspired by the poet-astronomer Omar Khayyám, writing a poem in Khayyám's style.

ROBIN HOOD AND HIS MERRY FORESTERS



Throughout *The Adventures of Tom Sawyer*, Tom and his friend Joe Harper act out scenes from *Robin Hood*. Gribben discovered that the characters are quoting a specific version of the tale, Joseph Cundall's 1841 classic, which Twain may have read as a child. "We used to undress & play Robin Hood in our shirt-tails," Twain reminisced in a letter.

ABOLITIONIST LITERATURE



Before writing *Adventures of Huckleberry Finn*—which uses the n-word 215 times—Twain read antislavery novels and slave narratives, including William Still's *Underground Railroad*. Twain captured the vernacular of the antebellum South, but it didn't reflect his views when he completed the book in 1884, says Gribben, who edited a 2011 version of *Huckleberry Finn* without the slur.

PARADISE LOST

DELLA TRADUZZIONE
DEL PARADISO PERDUTO
POEMA INGLESE
DI GIOVANNI MILTON
LIBRO PRIMO

In 1900, Twain applied his much-quoted maxim about classics to John Milton's *Paradise Lost*. It was, Twain said in a lecture, "something everybody wants to have read and nobody wants to read." Except Twain, who read it, loved it and bought a second copy for his wife. He also wrote his own versions of the story.

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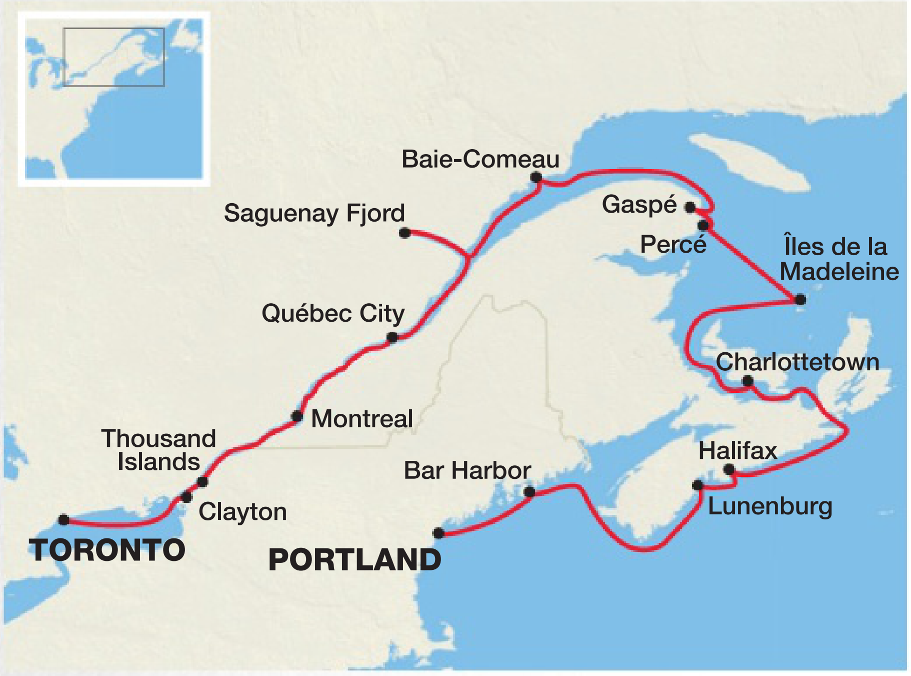
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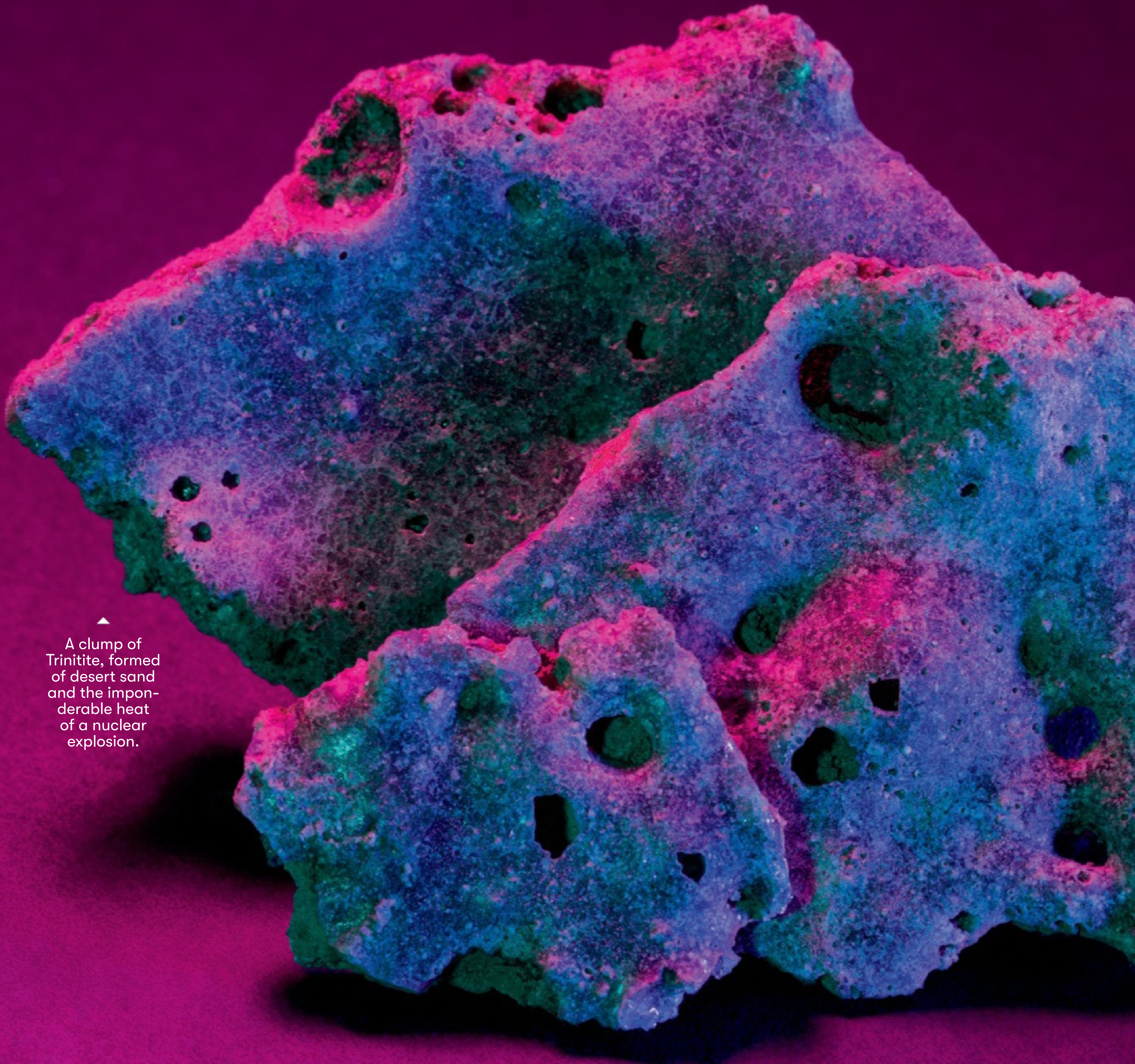


A clump of Trinitite, formed of desert sand and the imponderable heat of a nuclear explosion.

By
Richard Rhodes

Photograph by
Maggie West

War and Piece

A lowly chunk of earth is a telltale trace of the devastating weapon that would change the world forever

THE FIRST ATOMIC BOMB ever exploded was a test device, insouciantly nicknamed the Gadget. In mid-July 1945, American scientists had trucked the five-ton mechanism from their secret laboratory at Los Alamos, New Mexico, 230 miles south, to a place known to the scientists as Trinity in a stretch of southern New Mexico desert called the Jornada del Muerto—the journey of death. There they hoisted it into a corrugated-steel shelter on a 100-foot steel tower, connected the tangle of electric cables that would detonate its shell of high explosives, and waited tensely through a night of lightning and heavy rain before retreating to a blockhouse five and a half miles away to begin the test countdown.

The rain stopped and just at dawn on July 16, 1945, the explosion delivered a multiplying nuclear chain reaction in a sphere of plutonium no larger than a baseball that yielded an explosive force equivalent to about 19,000 tons of TNT. The 100-million-degree fireball vaporized the steel tower down to its footings, swirled up desert sand, melted it and rained down splashes of greenish glass before rising rapidly to form the world's first nuclear mushroom cloud.

No one commented on the glass at the time—its creation was the least of the Gadget's spectacular effects—but visitors to the site after the war noticed the unusual scattering of glassy mineral that surrounded the shallow bomb crater and began collecting pieces as souvenirs. "A lake of green jade," *Time* magazine described it in September 1945. "The glass takes strange shapes—lopsided marbles, knobbly sheets a quarter-inch thick, broken, thin-walled bubbles, green, wormlike forms." (Today, several samples of the substance, including the ones pictured here, reside at the Smithsonian National Museum of Natural History.) At first no one knew what to call the material. Someone named it "Alamogordo glass" because the test site was near that town. A 1946 ad in *Mechanix Illustrated* offered jewelry made of "'atomsite,' the atomic-fused glass from the Trinity Site." But the "-ite" suffix asked for something more specific than "atoms": The whole world was made of atoms. At Los Alamos they turned to the site itself for a name—Trinitite. Still, where did "Trinity" come from?

J. Robert Oppenheimer, the charismatic theoretical physicist who had directed the Los Alamos Laboratory where the first atomic bombs were designed and built, was something of a Renaissance man, a poet as well as a scientist and administrator. It was he who had named the desert site "Trinity." The domineering U.S. Army Corps of Engineers officer who had steered the Manhattan Project, Brig. Gen. Leslie R. Groves, later asked Oppenheimer why he picked such a strange name for a bomb testing range.

"Why I chose the name is not clear," Oppenheimer responded, "but I know what thoughts were in my mind. There is a poem of John Donne, written just before his death, which I know and love. From it a quotation:

As West and East
In all flat Maps—and I am one—are one,
So death doth touch the Resurrection.

"That still does not make a Trinity," Oppenheimer continued, "but in another, better known devotional poem, Donne opens, *'Batter my heart, three person'd God;—.'* Beyond this, I have no clues whatever."

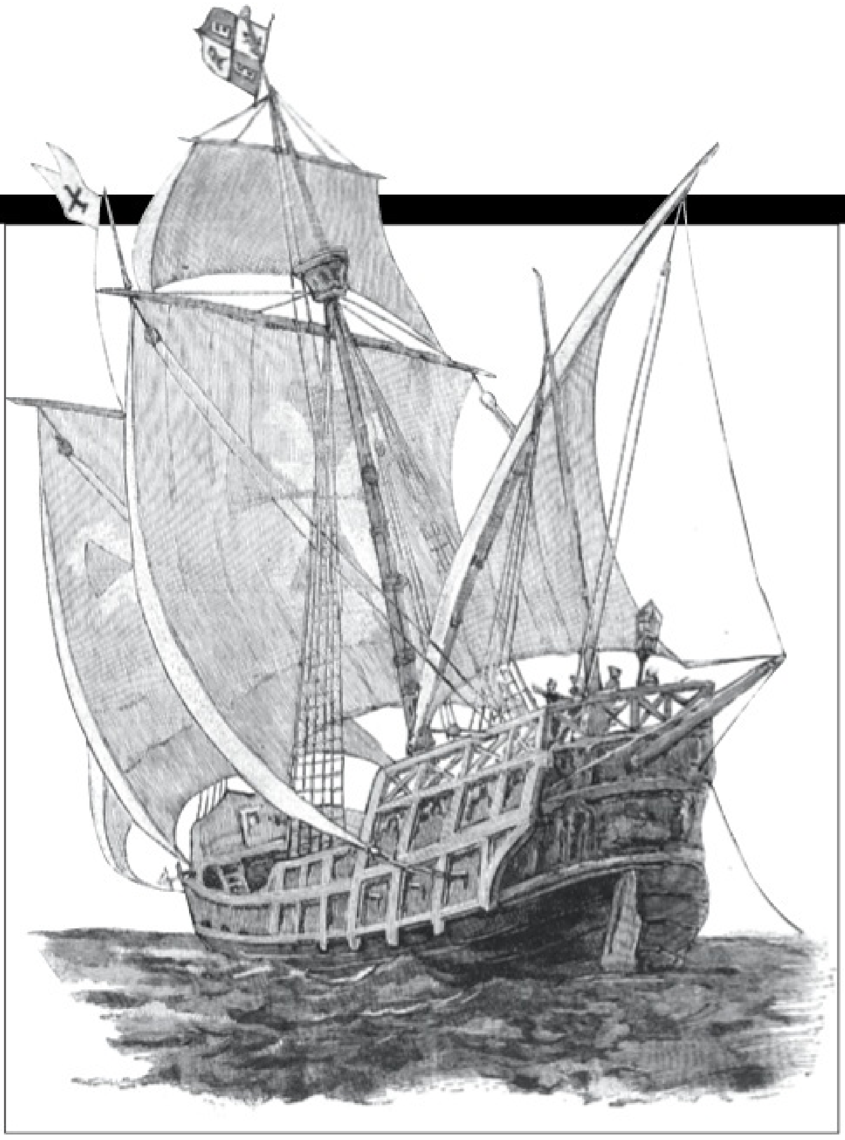
Oppenheimer could be obscure, not to say patronizing. Certainly he knew why he chose to name the test site after a poem by the pre-eminent metaphysical poet of Jacobean England, though he may not have cared to reveal himself to the gruff, no-nonsense Groves.

So the lopsided marbles and the knobbly sheets became Trinitite. It was primarily quartz and feldspar, tinted sea green with minerals in the desert sand, with droplets of condensed plutonium sealed into it. Once the site was opened, after the war, collectors picked it up in chunks; local rock shops sold it and still do. Concerned for its residual radioactivity, the Army bulldozed the site in 1952 and made collecting Trinitite illegal. What's sold today was collected before the ban. Unless you eat it, scientists report, it isn't dangerous anymore.

I bought a piece once as a birthday gift for a friend, the actor Paul Newman. Paul had been a 20-year-old rear gunner on a two-man Navy torpedo bomber, training for the invasion of Japan, when the second and third atomic bombs after Trinity exploded over Japan and did their part to end a war that killed more than 60 million human beings. "I was one of those who said thank god for the atomic bomb," Paul told me ruefully.

He liked the Trinitite. It was a dusting of something he believed had spared his life along with the lives of at least tens of thousands of his comrades and hundreds of thousands of Japanese soldiers and civilians. Oppenheimer informed Groves in August 1945 that Los Alamos could probably produce at least six bombs a month by October if the Japanese continued the war.

To this day at Trinity, worker ants mending their tunnels push beads of Trinitite up into the sunlight, a memento mori in ravishing green glass. ◆



ALAMY

Exploration

Riches of the Spanish Main

A DEEP DIVE INTO THE ARCHIVES YIELDS HUNDREDS OF LONG-FORGOTTEN SHIPWRECKS

By **Amy Crawford**

FOR FOUR CENTURIES, Spain's prodigious naval power built an empire that stretched around the globe. But not every military or merchant voyage ended well. In the first analysis of its kind by a former colonial power, Spain's Ministry of Culture has identified 681 shipwrecks in the Caribbean and along the southern Atlantic coast of the United States. They date from 1492, when Christopher Columbus' *Santa María* hit a sandbar near modern-day Haiti, to 1898, when the U.S. Navy sank the *Plutón* off the coast of Cuba during the Spanish-American War.

Carlos León Amores, an archaeologist, led a research team that spent five years sifting through Spanish archives to identify the doomed vessels, less than a quarter of which have been precisely located. More than 90 percent foundered in storms; only about 2 percent were sunk by pirates or rival navies. More than 50,000 people perished, some of them enslaved Africans.

The ships carried diverse cargoes, from food and weapons to religious objects, but it's the glittering products of Spain's New World colonies that have long attracted interest from historians and fortune seekers. Already the government's unpublished list is being called "the world's largest treasure map." But León Amores cautions that Spain is actually trying to stymie treasure hunters by laying claim to its "underwater cultural heritage."

It's not the first official shot across the bow. In 2012, Spain won a lawsuit against a U.S. salvage firm, which was forced to return 17 tons of gold and silver coins discovered in the wreck of the frigate *Nuestra Señora de las Mercedes*, sunk by the British near Portugal in 1804. Spanish authorities are currently embroiled in a dispute with the Colombian government and another U.S. firm over the 1708 wreck of the galleon *San José*, which carried gold, silver and emeralds that could be worth billions.

Still, the value of centuries-old wrecks is more than monetary. Each ship that sank between the Old World and the New is evidence of the beginnings of globalization. The real treasure is a better understanding of this powerful economic force that continues to shape the world today. ◆

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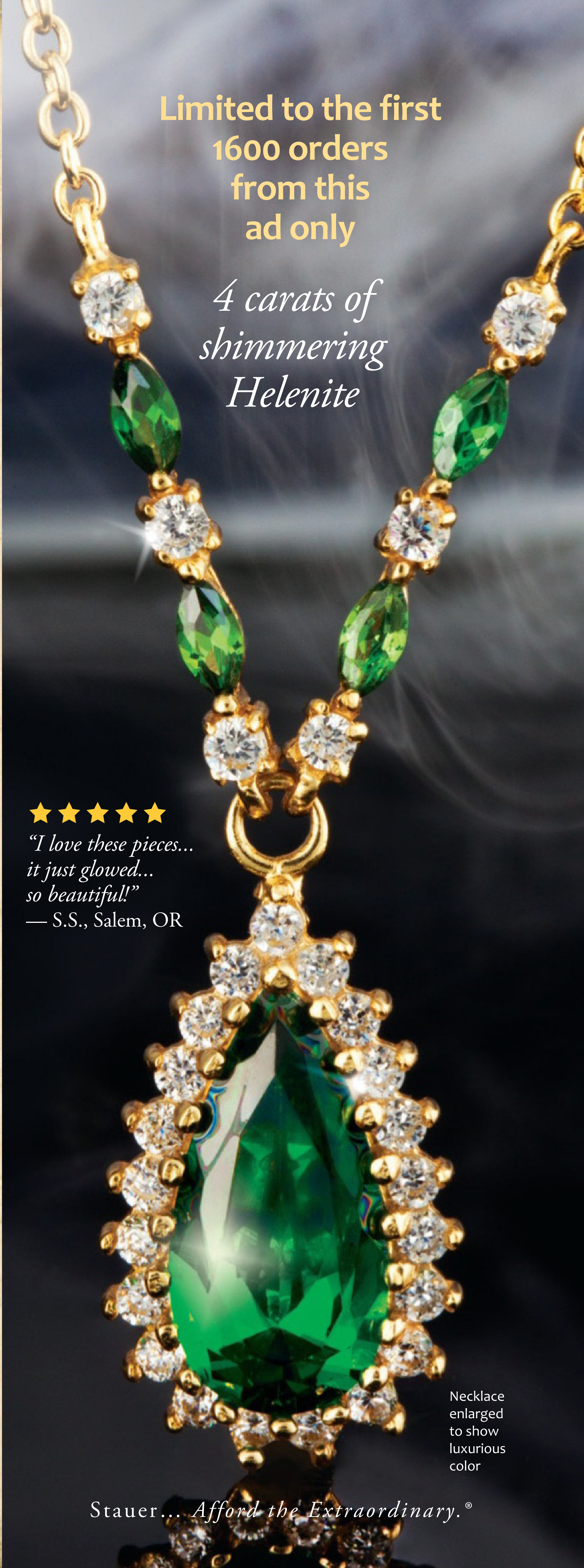
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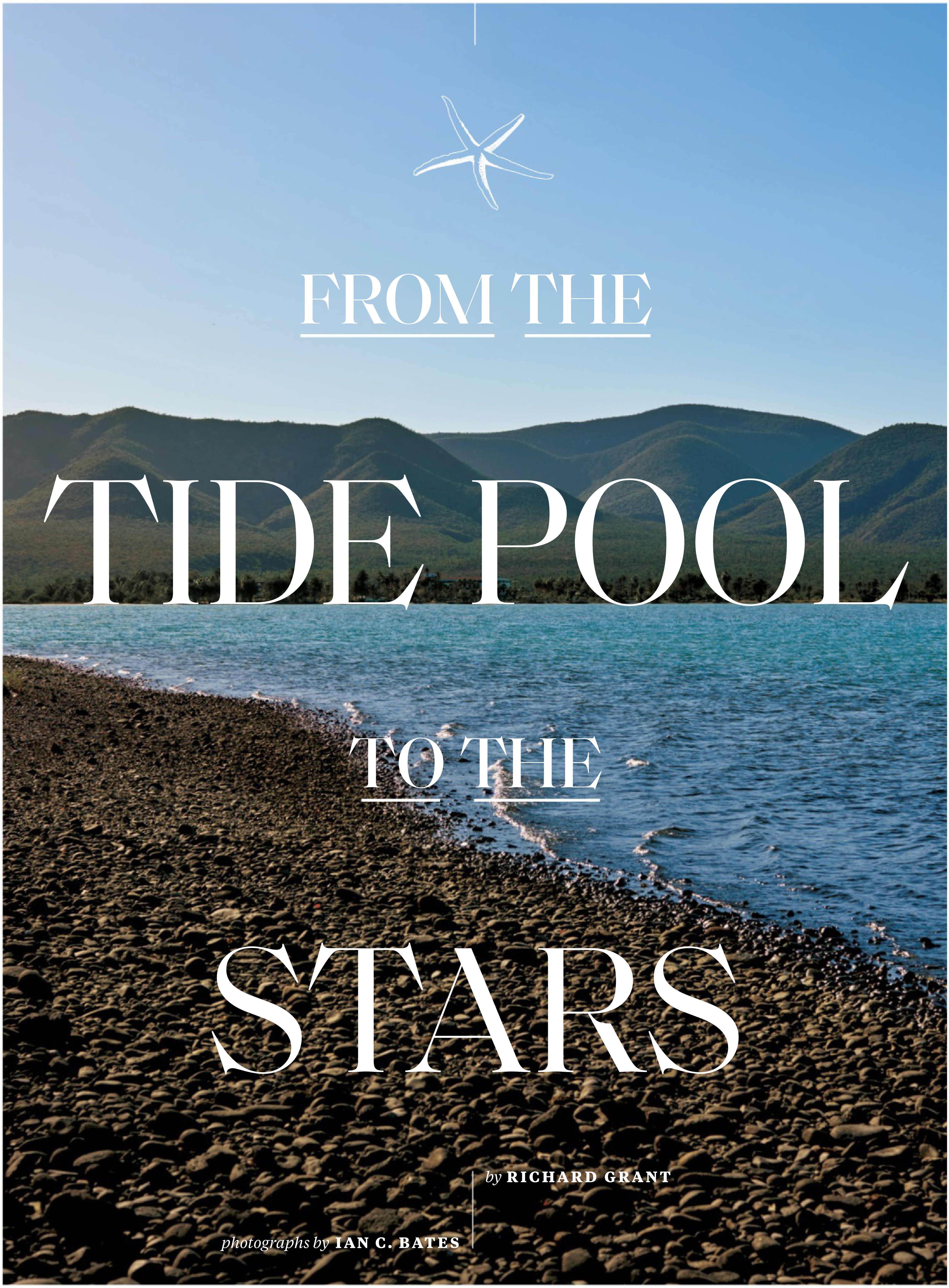
A LEGENDARY WRITER, A QUIRKY SCIENTIST AND **AN EPIC OCEAN VOYAGE** THAT WOULD REWRITE THE RULES OF ECOLOGY

JOHN STEINBECK
EDWARD F. RICKETTS

Novelist John Steinbeck, left, and marine biologist Ed Ricketts co-authored a beloved book after their 1940 adventure aboard the *Western Flyer*, a fishing boat now being restored.

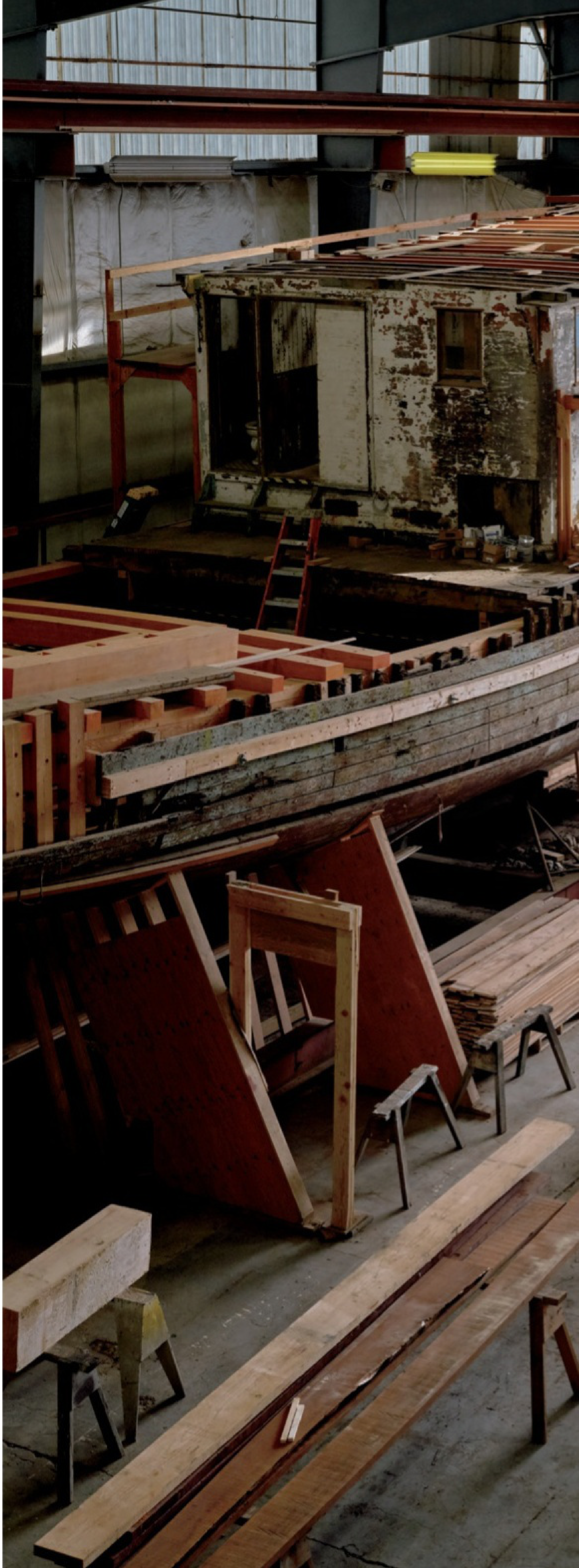


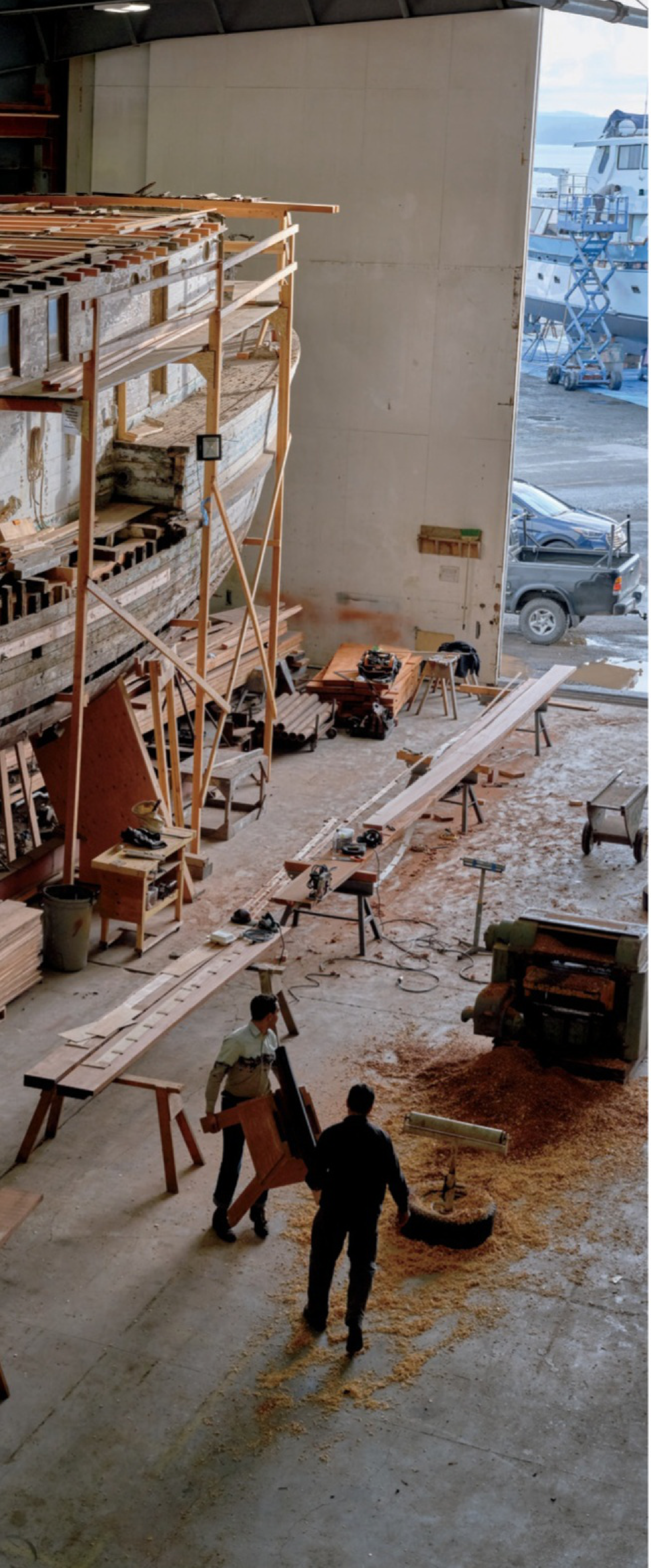
FROM THE TIDE POOL TO THE STARS

by **RICHARD GRANT**

photographs by **IAN C. BATES**

IT WAS THE FOURTH SINKING of its long career, and this time the old wooden fishing boat lay submerged for nearly six months in brackish water and mud. When the authorities finally hauled it to the surface and towed it to Port Townsend, Washington, in June 2013, the *Western Flyer* looked like a ghost ship. Veils of seaweed hung from its rotting timbers, and it was encrusted with barnacles. The insides were full of mud. At the boatyard the wreck was valued at $0, but a purchaser from California, John Gregg, paid $1 million for it, or more precisely, for its mystique.





In Port Townsend, Washington, shipwrights toiling on the scuttled *Western Flyer* face steep challenges, replacing 70 percent of the boat, from stem to stern.

The $3 million to rebuild will embrace the latest electronics while aiming to preserve the craft's historic character.

In the spring of 1940, the boat was chartered for six weeks by the novelist John Steinbeck, who had published *The Grapes of Wrath* the previous year, earning national acclaim, sudden wealth and death threats from reactionaries outraged by the novel's populist message. With his close friend Ed Ricketts, a brilliant, eccentric marine biologist, Steinbeck sailed to the Sea of Cortez to survey marine life along the Baja coast, escape from the modern world and Steinbeck's new celebrity, and hone the deep, holistic, ecological philosophy that they were developing in tandem.

It was the most renowned literary collaboration between a great American novelist and a great American scientist, and it produced a highly original and influential book. *The Log from the Sea of Cortez,* Steinbeck's account of the trip, is a high-spirited blend of adventure travel writing, marine science and freewheeling philosophy, shot through with a marvelous sense of wonder at the interconnectedness of the world. Like Thoreau's *Walden* or Aldo Leopold's *Sand County Almanac,* it is a foundational text for the modern environmental movement, but looser and funnier than its counterparts. Steinbeck told his third wife, Elaine Anderson, that it was the best book of his career, and it still inspires a cult-like devotion.

One of the devotees is John Gregg, a 57-year-old geologist who owns a California-based company specializing in geotechnical engineering, deep-ocean coring and underground testing for contaminants. He's now spending another $2 million—his own

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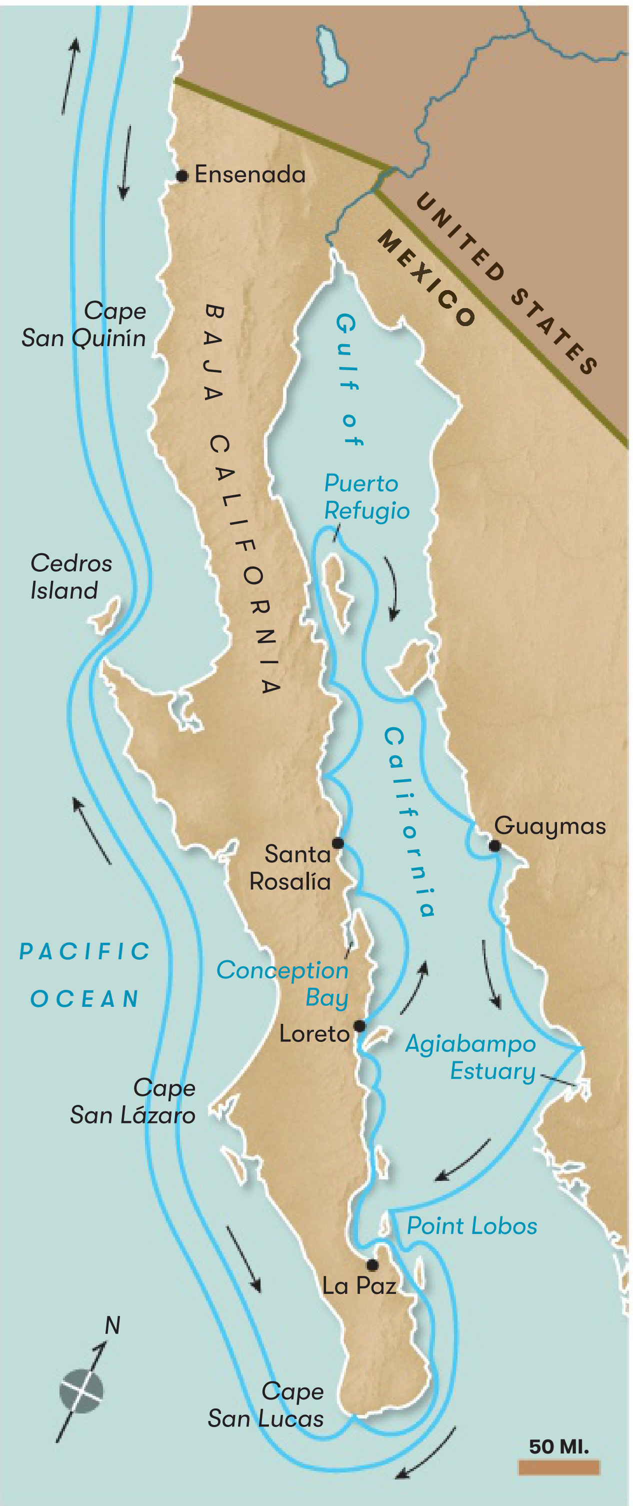
money, grants and publicly raised funds—to make the *Western Flyer* seaworthy again. He intends to get the boat into the water in 2020, honoring the 80th anniversary of the Steinbeck and Ricketts voyage, and follow their Sea of Cortez route, with artists, writers and scientists aboard. After that, the boat will become an education and research vessel.

The *Western Flyer*, a 77-foot purse seiner built of old-growth Douglas fir in 1937, has outlasted nearly all its contemporaries, despite its sinkings. The people working with the boat all talk about its extraordinary "life force." This would not surprise Steinbeck, who wrote in *The Log* that "a boat, above all other inanimate things, is personified in man's mind." He added a line often quoted by the shipwrights, scientists and scholars involved with the *Western Flyer* today: "Man, building this greatest and most personal of all tools, has in turn received a boat-shaped mind, and the boat, a man-shaped soul."

FLYER'S FAMED TRIP TO MEXICO



MAP: GUILBERT GATES

* * *

JOHN GREGG IS TALL, blond, blue-eyed, with a rumpled appearance and an unflappable attitude. Looking out at the Sea of Cortez, also known as the Gulf of California, on a bright breezy morning in Baja, he explained to me how his obsession began.

In 1971, when he was 11, his family was living in Brunswick, Georgia. It was a poor rural community with no library, but every two weeks an eagerly anticipated bookmobile would arrive. "It was a rounded van, and you deposited your books in the front, and went out through the back," he says. "You were allowed five or six books, and you only had five or six minutes to choose them, so it was a scramble. On one of the covers, I saw a picture of a boat in a big green sea with a yellow sky. It looked like an adventure book, and that's what I liked, so I grabbed it without thinking."

It was a 1951 edition of *The Log from the Sea of Cortez*. Although he was hoping for pirates, monster storms and aggrieved whales, he became completely absorbed by Steinbeck and Ricketts' gentler adventures in coastal tide pools and Mexican port towns. "I already knew I wanted to be a scientist, and I understood they were doing serious science," he says. "But they were also having fun, talking philosophy under the stars, and catching fish. They were young and sunburned and drinking. Every port they went into sounded great. I loved everything about it."

He started reading other Steinbeck books, and Monterey, California, where Steinbeck and Ricketts lived in the 1930s and early 1940s, became a "mythical place" for him. When Gregg went there for the first time, in 1982, he was astonished to discover that Ed Ricketts' former laboratory still existed, although it was locked and closed to the public. Sandwiched between two sardine canneries, the lab had also functioned as a raucous party spot, and a salon where Steinbeck, Ricketts and others, including Joseph Campbell, the scholar of human mythology, drank heavily and discussed science, literature, art and philosophy among cages of live rattlesnakes and jars of pickled sea creatures.

^ Geologist-owner John Gregg, here in Baja, plans to turn the *Flyer* into a floating classroom, plying the 1940 route, opposite.

“I always wanted **to use the boat as an ambassador** to do something new and interesting and scientifically important.”

“I swore to myself I would get in the lab somehow, just to see it,” says Gregg. “I don’t remember a conscious decision to get the *Western Flyer* and fix it up. I assumed it would happen, even though I had no proof the boat still existed.”

Gregg spent decades looking for the *Flyer*. “Nobody in Monterey knew anything,” he says, “but I heard a few things in the Pacific Northwest and Alaska. Whenever I was up there, I would check at the boatyards and fishing docks, and ask about the *Flyer*. People would say, ‘No, it’s been crushed,’ and, ‘Yes, it’s fishing in Alaska,’ and, ‘No, it sank, but so-and-so has the wheel.’”

Finally, in 2011, Gregg learned that the boat’s name had been changed to *Gemini*, and it was owned by a real estate developer and Steinbeck fan named Gerry Kehoe. “I called Kehoe,” says Gregg, “and I kept calling him for two years, but I couldn’t get a reply.”

The old retired boat was moored in a slough near Anacortes, Washington, in very poor condition, but Kehoe had big plans. He was going to cut it into pieces and reassemble it in the lobby of a new hotel, or turn it into a floating restaurant on an indoor moat in a former haberdashery, as part of a new tourist complex in Salinas, California, where Steinbeck was born and grew up. Before Kehoe could realize his plans, a plank ruptured in the boat’s hull and it sank. It cost him a reported $100,000 to raise the boat. Four months later, in January 2013, it sank again—and stayed down for nearly six months.

“When they got her raised and into dry dock at Port Townsend, Kehoe started taking my calls,” says Gregg. “He finally agreed to meet me in a restaurant in Salinas. We both had our lawyers there. Kehoe is a gruff, tough, old Irish guy and he was staring at me across the booth. In the first ten seconds, he knew I was going to buy the boat and pay too much for it. I knew it too.”

Kehoe said the boat would cost $1.5 million. Gregg offered $200,000. They had another meeting a few months later. “My lawyer was my brother Andy, and he was kicking me under the table when I agreed to pay a million,” says Gregg. “I knew it was way too much, but I wanted to make it happen. I’ve never been a money person. If you spend too much, you can make some more. That’s how I looked at it. Then I had to post a $25,000 bond because the boat was derelict, and the boatyard had valued it at zero. That did give me pause.”

Gregg will admit to love, obsession and “borderline folly” in his relationship with the *Western Flyer*, but he insists that sentimental nostalgia is not part of it. “I always wanted to use the boat as an ambassador to do something new and interesting and scientifically important,” he says. “And I think that’s what Steinbeck and Ricketts would have wanted. They had no nostalgia for old things.”

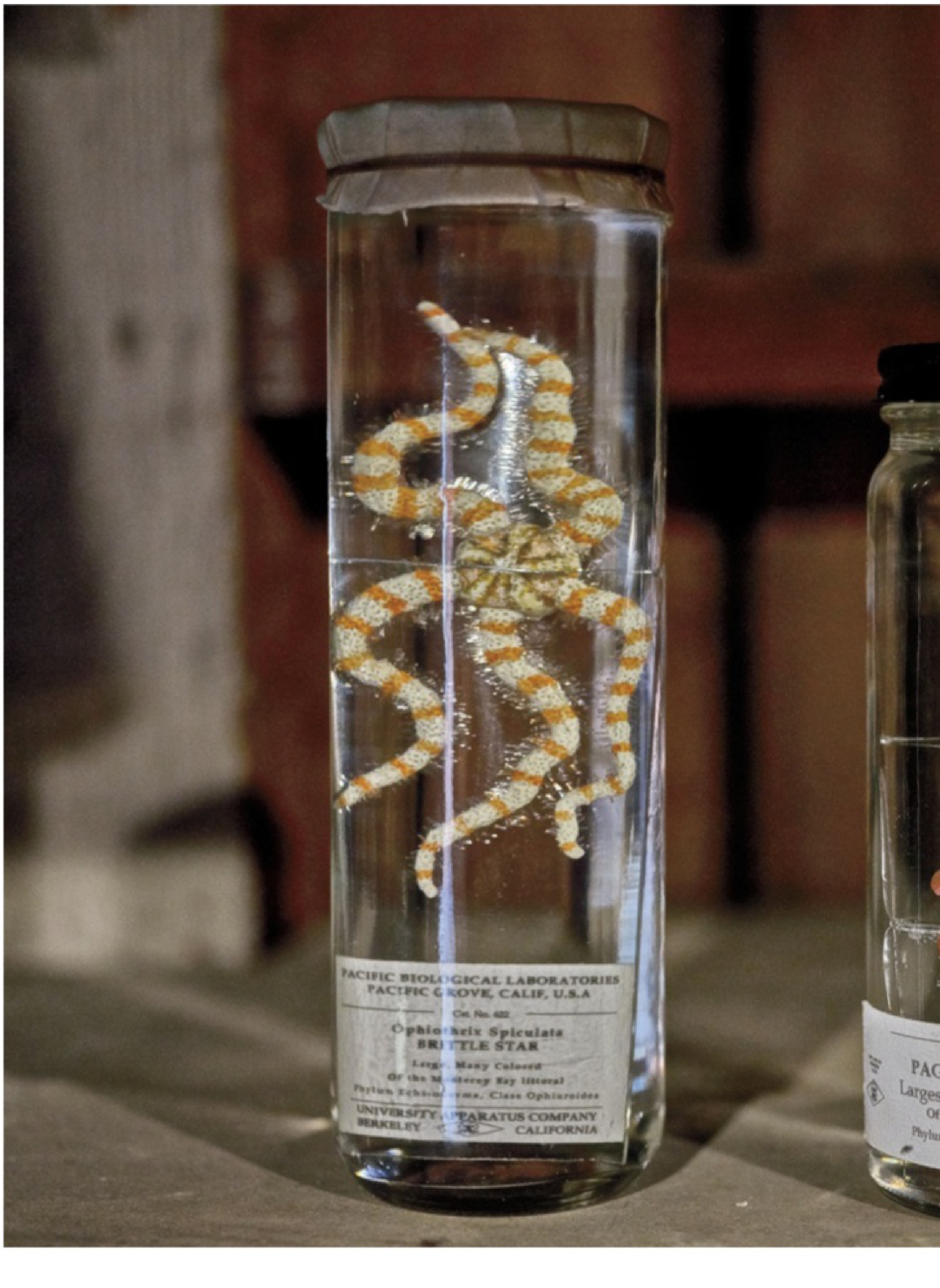
“His **mind was kaleidoscopic**. He corresponded with scientists all over the world, and he was friends with all the bums and prostitutes on Cannery Row.”

*

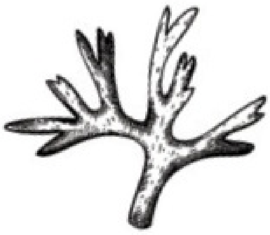
ON CANNERY ROW in Monterey, the street that Steinbeck immortalized in fiction, there stands an unobtrusive wooden building with redwood shingles and a small sign reading “Pacific Biological Laboratories.” Susan Shillinglaw, former director of the National Steinbeck Center in nearby Salinas, has agreed to show me the lab where Ed Ricketts, the model for Doc in Steinbeck’s 1945 novel, *Cannery Row*, prepared his biological specimens, and held his parties and salons.

The brothel across the street is gone, as is the Chinese grocery where Ricketts usually bought two quarts of beer in the morning, and more throughout the day. The working sardine canneries are gone too, replaced by Cannery Row-themed souvenir shops, restaurants and attractions. “Most tourists come here because of Steinbeck and the book, and they walk right past the lab,” says Shillinglaw, a literary scholar, whose enthusiasm for Steinbeck has never waned over three decades of studying the author. “They don’t know that this is the lab in the book, or how important it was to Steinbeck’s life and work. Ed Ricketts shaped his thinking more than anyone.”

She leads me through the front door into the room where Ricketts preserved his “little beasties,” as he sometimes called them, and entertained guests. Five years older than Steinbeck, with a slim, wiry build, and a gaunt, handsome face, Ricketts had charisma and a saintly tolerance for most human foibles, although he detested teetotalers and was horrified by old age. He was “libidinous as a goat,” in Steinbeck’s phrase, and led many women to his small, uncomfortable bed in the back room. “Ed liked his women as complicated as possible,” says Shillinglaw. “If they were single and available with no psychological problems, he wasn’t in-


PACIFIC BIOLOGICAL LABORATORIES
PACIFIC GROVE, CALIF, U.S.A
Ophiothrix Spiculata
BRITTLE STAR
Large, Many Colored
Of the Monterey Bay littoral
Phylum Echinoderma, Class Ophiuroidea
UNIVERSITY APPARATUS COMPANY
BERKELEY CALIFORNIA

WEBS OF LIFE Clockwise from left, Ricketts, at Monterey, California, in the 1930s, pioneered the science of marine ecology. The El Vizcaíno Biosphere Reserve, on Baja California's Pacific coast: As Ricketts wrote, anyone visiting "a rocky shore at low tide has entered possibly the most prolific life zone in the world." Steinbeck scholar Susan Shillinglaw: Her works include a cultural history of *The Grapes of Wrath*. Specimens at the Pacific Biological Laboratories, like those collected by Ricketts.



Cat. No. 814.35
GURUS HEMPHILLI
st tidepool Hermit Crab
the central California coast
m Arthropoda, Class Crustacea
Order Decapoda

ED RICKETTS JR. / PAT HATHAWAY COLLECTION; GETTY IMAGES / ISTOCKPHOTO

terested." In the essay "About Ed Ricketts," which is included in *The Log from the Sea of Cortez*, Steinbeck joked, "If he could have found a woman who was not only married, but a mother, in prison, and one of Siamese twins, he would have been delighted." Among his eccentricities was a phobia of getting his head wet. He waded happily in tide pools up to his chest, but a single raindrop on his head would throw him into a panic, so he wore waterproof hats.

Despite his vast daily intake of beer, Ricketts worked long hours in the lab with great precision, wrote extensively, and devoured scientific monographs and other challenging books. "His mind was kaleidoscopic," says Shillinglaw. "He was into Jungian psychology, Nietzsche, Chinese poetry, medieval music, classical music. He corresponded with scientists all over the world, and he was friends with all the bums and prostitutes on Cannery Row." On the walls of this room, Ricketts hung yards and yards of graph paper with colored lines tracing the musical and artistic achievements in China, Western Europe, Greece, Rome and Egypt. The lines illustrated his theory that culture advances in sudden dramatic jumps followed by long plateaus.

Steinbeck, as a young, struggling, fiercely dedicated writer, met Ricketts in 1930, and they became friends and encouragers of each other's work. In 1939, the same year Steinbeck published *The Grapes of Wrath*, Ricketts came out of obscurity with *Between Pacific Tides*, a seminal work of marine biology still taught today. Instead of grouping creatures taxonomically, he grouped them by habitats and examined them as communities—an early breakthrough in ecological thinking.

*

IN JANUARY AND FEBRUARY of 1940, the two men, and Steinbeck's first wife, Carol, rushed to organize the expedition to Baja California. Originally conceived as a car trip, it had morphed into a 4,000-mile sea journey, with at least 25 stops planned for collecting marine invertebrates. None of the local boat owners would charter them a vessel for such a ridiculous-sounding project, but along came the *Western Flyer*, sailing into Monterey Bay with captain Tony Berry at the helm. He had done a scientific research trip in Alaska between fishing runs, and found it easy enough, so he agreed to a six-week charter.

They loaded up the *Flyer* with equipment, books, food, wine and other supplies. After a massive farewell party at the Monterey dock, they fired up the engine and chugged away down the California coast. You wouldn't know it from reading *The Log*, but in addition to Ed Ricketts, Tony Berry and the three-man crew, Carol Steinbeck was onboard with her husband. Susan Shillinglaw, who wrote a fascinating

Near Santa Rosalía, Baja California Sur. Steinbeck and Ricketts anchored at barrier islands, using long-handled dip nets to collect creatures.

book about the Steinbecks' marriage, has thought hard about why John omitted Carol from *The Log*.

"John was already involved with someone else, the marriage was coming apart, and the trip was supposed to fix it, which it didn't," she says. "But I think the real reason he left her out is literary. It's much easier to make the narrative flow without introducing Carol as a character. He doesn't introduce Ed as a character either, but he's implicit in the 'we' that John uses to narrate the book."

With the engine running day and night, they went straight to Cabo San Lucas at the southern tip of the Baja Peninsula. What is now a ritzy A-list resort was then "a sad little town," with a doleful cantina full of cockroaches and men who couldn't afford to buy a drink. On the wave-battered coastal rocks, however, they found life teeming with "exuberant fierceness," and took samples of dozens of species. They preserved them carefully in formaldehyde, and then sailed into the Sea of Cortez.

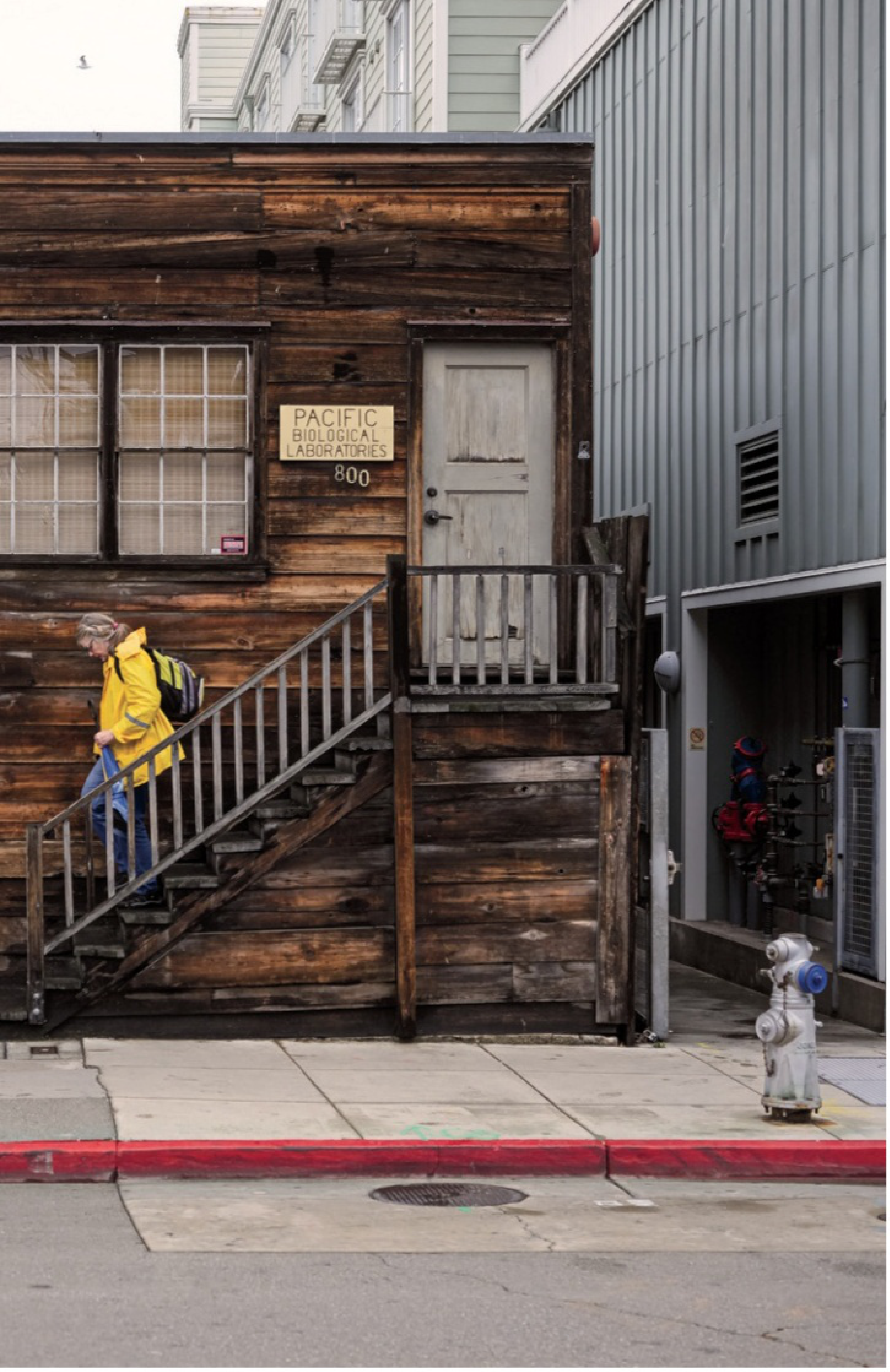
Biologically speaking, this 700-mile-long sea has some of the richest waters on earth, in drastic contrast to the hard, stony, cactus-studded desert on the surrounding shores. Even today, Baja California is dominated by a feeling of remoteness; in 1940 it seemed like the end of the earth. Tony Berry, an orderly man who loved solid facts, was unsettled by the persistent mirages in the deceptive air, and Steinbeck found it all deeply mysterious, "The sky sucks up the land and disgorges it. A dream hangs over the whole region, a brooding kind of hallucination."

As they moved from one low-tide collecting station to the next, they were studying the distribution of marine invertebrates, but their curiosity was "wide and horizonless," Steinbeck wrote, and they thought it was a mistake to look at anything, from a sea cucumber to a Mexican folk saint, without recognizing that it lay within a vast, outspreading, almost infinite web of connections.

In port towns, they roistered in cantinas and brothels, marveled at cathedrals. It was hard work collecting specimens in the tide pools, chasing down specimens and prying others off rocks, getting bitten and stung. Evenings were given over to fresh fish and pasta and copious amounts of wine and beer. Carol, who had a lively, inquiring mind and a penchant for witty conversation, would have probably joined in the philosophical discussions that John and Ed so enjoyed.

Extrapolating from an encounter with an industrial Japanese shrimp fleet dredging every living thing from the bottom of the sea, Ricketts and Steinbeck foresaw a global environmental catastrophe that threatened the "eventual welfare of the whole human species," Steinbeck wrote. That prophecy sounds all too plausible today, but very few people were making it in 1940.

"Out of a hundred, you might inspire six **to do ocean science**, and that would be great."



After Ricketts' death, artists, writers and others kept gathering at the lab in his honor. In 1957, some of them dreamed up the Monterey Jazz Festival.

Summing up the worldview that emerged from the journey, Steinbeck wrote, "All things are one thing and that one thing is all things—plankton, a shimmering phosphorescence on the sea and the spinning planets and an expanding universe, all bound together by the elastic string of time. It is advisable to look from the tide pool to the stars and then back to the tide pool again."

He ends the book with a description of the *Western Flyer*'s big guy-wire, from bow to mast, vibrating in the wind like the low note of a pipe organ, as the boat hunched through big waves on the way home to Monterey. John and Carol's marriage ended soon after their return, and John set about writing his account of the trip. It was first published in a 600-page book, *Sea of Cortez*, co-authored with Ricketts, and including a 300-page scientific catalog of the marine species they encountered. It sold only 2,000 copies. Ten years later, John extracted his travel narrative, added the essay "About Ed Ricketts," and published it as *The Log from the Sea of Cortez*. It had mixed reviews, and modest sales at publication, but its reputation grew over time.

The *Western Flyer* went on to become an apex predator in the Pacific and Alaska. It helped devastate the great Pacific sardine fishery, which spelled the end of Cannery Row. Then it started trawling for ocean perch, "as if clear-cutting an ancient forest," in the words of Kevin Bailey, a fisheries scientist who wrote a book about the *Flyer*'s career. When the perch were almost gone, in 1969, it joined in the rampant overfishing of red king crabs and salmon in Alaska. In June 1971, loaded with 120,000 pounds of salmon, it half-sank after hitting a reef and was declared a "total loss" by the Coast Guard. That was the end of its career in the open ocean, although it continued fishing in Puget Sound. By one estimate, a billion fish died on its decks.

*

NOW THE *FLYER* RESTS in a huge wooden cradle at the boatyard in Port Townsend, a mere specter of a ship in the process of resurrection. Chris Chase, a chatty, good-humored shipwright in his mid-50s, is the man in charge. "This is highly unusual," he says. "In the boat business, we don't do restorations. We do repairs. If a boat can't be repaired, we scrap it and build a new one."

The wooden boat was far beyond repair. It was a warped, decaying, disintegrating ruin, with sections of rot from stem to stern. "But she still had this life force," he says. "When they were towing her, they couldn't believe how fast she was moving through the water, like she was happy to be out of the mud and floating again."

He leads me up a ramp onto the deck, pointing out her elegant, curving lines. "These boats were built to be pickup trucks of the sea, with an engine and a hold, but they still wanted them to be beautiful, and have that man-shaped soul," he says. "We're trying to preserve the soul of

CONTINUED ON PAGE 82

The mysterious skeleton emerged from Lake Mungo, a dry lakebed in Australia marked by sand drifts.

THE HOM

BY TONY PERROTTET

PHOTOGRAPHS BY DAVID MAURICE SMITH

HE WALKED THE EARTH

42,000 YEARS AGO.

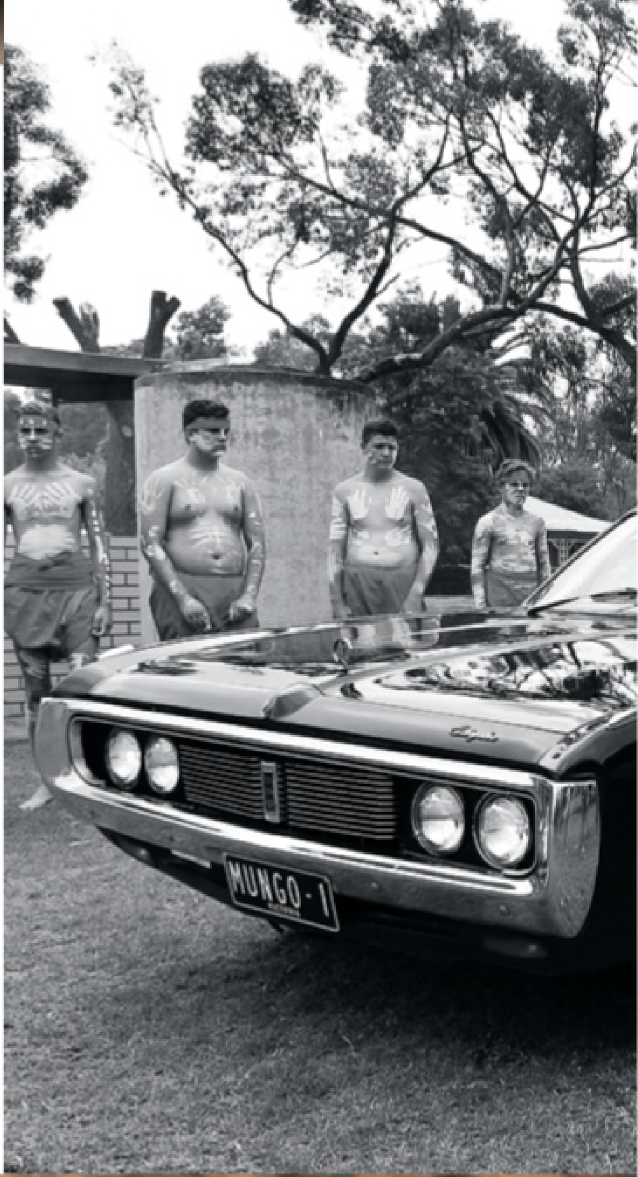
ECOMING

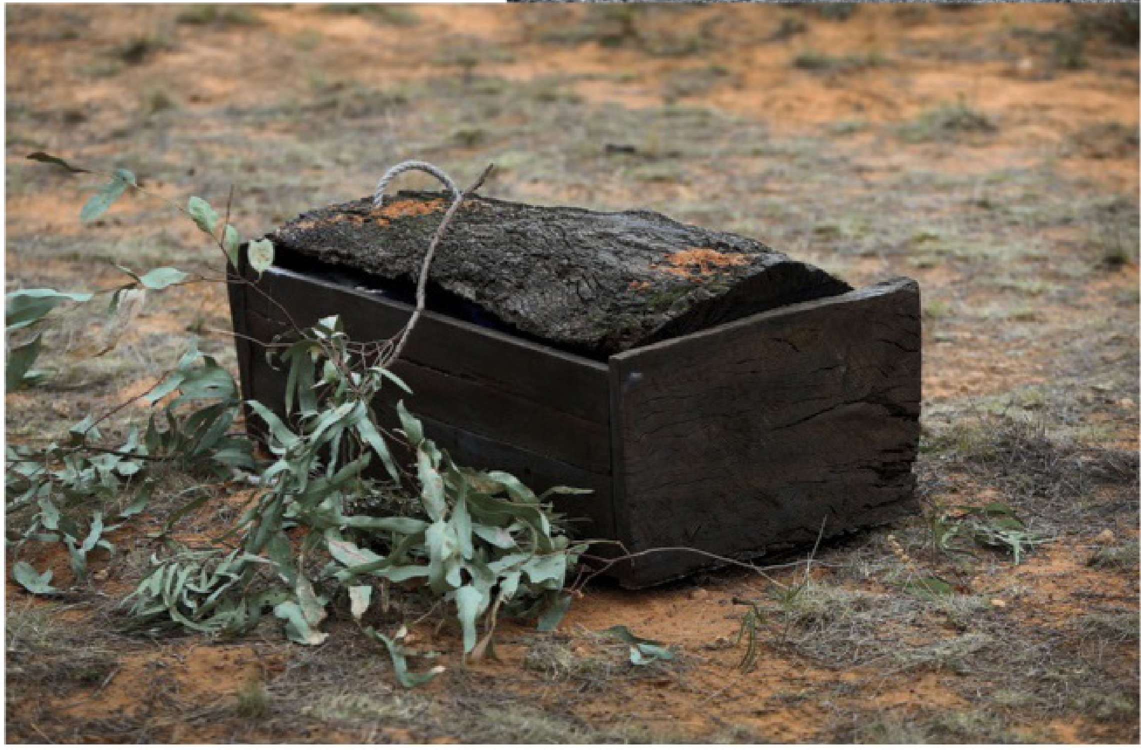
NOW HIS REMAINS ARE AT REST

AFTER AN AGONIZING CLASH

BETWEEN MODERN SCIENCE

AND ANCIENT SPIRITUALITY





Mungo Man's casket was made from an 8,000-year-old red gum. Aboriginal people use the sap from the tree for medicinal purposes.

IT WAS ONE OF THE MORE cinematic funeral caravans in recent memory. In November 2017, a black vintage hearse trundled across the verdant Australian sheep country west of Sydney toward the shimmering deserts of the outback. Laid out inside was a beautiful rough-hewn casket crafted from 8,000-year-old fossilized wood. A convoy of Aboriginal elders and activists followed close behind. At every stop on the way—in sonorously named bush towns like Wagga Wagga, Narrandera and Gundagai—the vehicle was met by jubilant crowds. In Hay, two Aboriginal men escorted the hearse into a park, where an honor guard of teenage boys carried the coffin to an ancient purification ceremony that involved cleansing it with smoking eucalyptus leaves. The rite was accompanied by traditional songs to didgeridoo music, dancing men in body paint and a slightly more contemporary Aussie "sausage sizzle." After dark, a security guard stood vigil over the vehicle and its contents.

At last, on the third morning of the 500-mile trek, the hearse turned alone onto an unpaved desert highway toward the eerie shores of Lake Mungo, which despite its name has been a dry moonscape for the past 16,000 years. There, a crowd of several hundred people, including Australian government officials, archaeologists and representatives of Aboriginal groups from across the continent, fell into a reverent silence when they spotted the ghostly vehicle on the horizon kicking up orange dust.

The hearse was bearing the remains of an individual who died in this isolated spot over 40,000 years ago—one of the oldest *Homo sapiens* ever found outside Africa. His discovery in 1974 reshaped the saga of the Australian continent and our entire view of prehistoric world migration. The skeleton of Mungo Man, as he is known, was so well preserved that scientists could establish he was about 50 years of age, with his right elbow arthritic from throwing a spear all his life and his teeth worn, possibly from stripping reeds for twine.

Now he was returning home in a hearse whose license plate read, with typical Aussie humor, MUNGO1. He would be cared for by his descendants, the Ngiyampaa, Mutthi Mutthi and Paakantyi people, often referred to as the 3TTGs (Traditional Tribal Groups). "The elders had waited a long, long time for this to happen," says Robert Kelly, an Aboriginal heritage officer who was present. Also standing in the crowd was a white-haired geologist named Jim Bowler, who had first found the skeleton in the shift-

Aborginal people pay their respects as a hearse carries the remains of Mungo Man and 104 other ancestors to their final resting place at Lake Mungo.

ing sands and had lobbied to have it returned to the Aboriginal people. Like many indigenous groups, the tribes believe that a person's spirit is doomed to wander the earth endlessly if his remains are not laid to rest "in Country," as the expression goes. Jason Kelly, a Mutthi Mutthi representative, was in the hearse on the last leg of the journey. "It felt like a wave was washing over me," he recalls. "A really peaceful feeling, like everything was in slow motion."

But even as the long-awaited, deeply symbolic scene was unfolding, scientists were making appeals to the Aboriginal elders not to bury the bones, arguing that the materials are part of a universal human patrimony and too important not to be studied further. In fact, from the moment he had been discovered, Mungo Man was entangled in bitter political battles over the "repatriation" of ancestral remains, a kind of dispute that would echo around the world, pitting researchers against indigenous peoples as diverse as Native Americans in Washington State, the Herero of Namibia, the Ainu of Japan and the Sámi of Norway, Finland and Sweden.

Bone collecting has been a key part of Western science since the Enlightenment, yet it's now often assailed as unethical, and nowhere more so than in Australia. After generations of ignoring Aboriginal appeals, the country is now a world leader in returning human remains as a form of apology for its tragic colonial history. "The center of the debate is: Who owns the past?" says Dan Rosendahl, executive officer of the Willandra Lakes Region World Heritage Area. "Science says it belongs to everybody. People tried to lock onto that in Australia. But there were 1,700 generations before Europeans got here, so it's clearly not everybody's past."

To better understand the growing chasm between the Western, scientific worldview and the spiritual outlook of indigenous cultures, I made my own expedition around the interior of Australia, meeting Aboriginal elders, museum curators and scientists key to the Mungo Man's strange and fascinating saga. My final goal was the hallucinogenic landscape of Lake Mungo itself, which is gaining cult status among Aussie travelers as the Rift Valley of the Pacific Rim. At its core, Aboriginal people find the Western desire to place them within human history irrelevant. Scientists trace human origins to Africa 2.5 million years ago, when the genus *Homo* first evolved. The species *Homo sapiens* emerged in East Africa 200,000 years ago, and began to migrate from the continent around 60,000 years ago. (Other species had likely first migrated two million years ago; Neanderthals evolved 400,000 years ago.) The Aboriginal people believe that they have lived in Australia since it was sung into existence during the Dreamtime. The carbon dating of Mungo Man came as no surprise to them. "To us blackfellas, we've been here forever," said Daryl Pappin, a Mutthi Mutthi archaeological fieldworker. "That date, 42,000 years, was published as a 'discovery.' That's not true. They've just put a timeline on it that whitefellas can accept."

* * *

MY SOJOURN BEGAN IN Australia's capital, Canberra—Down Under's version of Brasília—an artificial city created as a gateway to the continent's vast hinterland. Today, its broad, empty highways are lined with Art Deco monuments and avant-garde structures scattered like giant Lego blocks. By its serene lake, I met Michael Pickering, director of the Repatriation Program at the National Museum of Australia, which oversaw Mungo Man's hand-over. "Other indigenous communities were watching worldwide," Pickering, a soft-spoken character in his early 60s who travels the world dealing with human remains, said proudly as we climbed into his SUV. Most skeletons in museums are only 500 years old and in poor condition, he said, especially if they were found in damp coastal areas, so their return arouses little scientific

PP. 40-41: 123RF; LISA MAREE WILLIAMS / GETTY IMAGES; OZZICHKA / SHUTTERSTOCK

ARID THOUGH THE LANDSCAPE WAS, THE NOMADIC ABORIGINAL GROUPS KNEW HOW TO LIVE OFF THE DESERT.

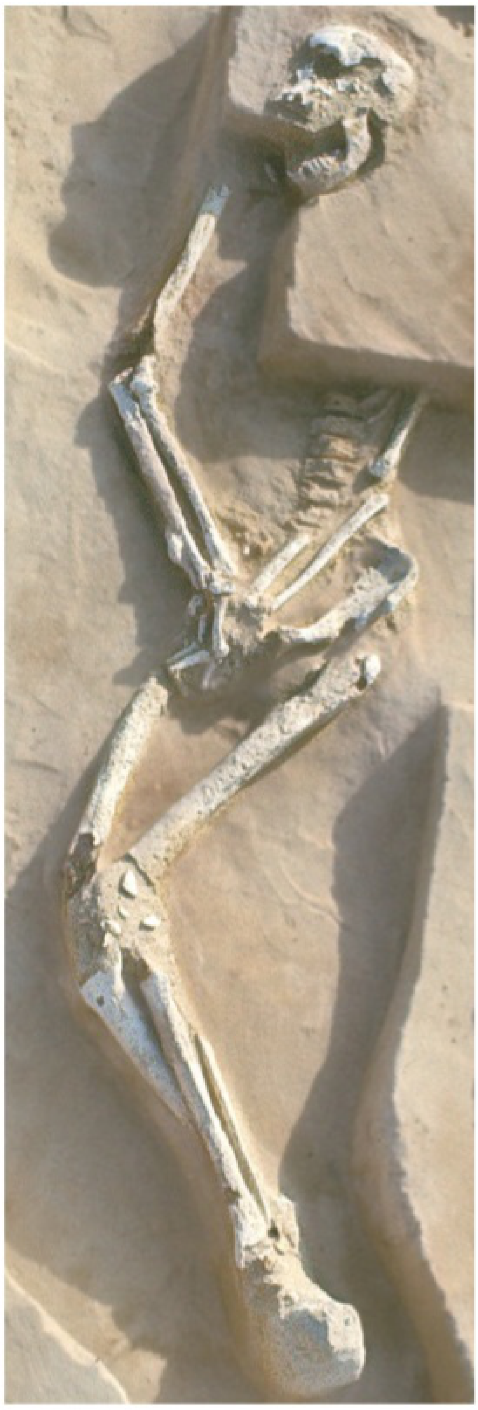
opposition. But Mungo Man was intact, a unique piece of prehistoric evidence.

We drove from the picturesque lakefront to a prosaic, ramshackle suburb called Mitchell. In a neighborhood with warehouses selling industrial appliances in the shade of stringy eucalyptuses, Pickering stopped at a security gate and punched in a code to open it; only after more codes, special keys and signing a logbook could we enter a cavernous museum storage facility crowded with relics, like a theater prop room. In archival drawers were convict leg irons from the early 1800s, jars of antique marsupial specimens, copperplate etchings of native plants made by naturalists on Capt. James Cook's 1770 expedition. Our goal was a room within the warehouse—the Repatriation Unit. "It's not pretty, but very functional," Pickering said, as he unlocked the door. The space is austere and solemn, with beige walls and icy climate control. Neatly stacked in a back room were some 300 cardboard boxes, some as small as shoe boxes, each one containing Aboriginal bones. Many were retrieved from Canberra's now-defunct Institute of Anatomy, which exhibited skeletons to the public from the 1930s to 1984. Some have been sent by private Australians, sometimes in cookie tins or crates. Others came from museums in the United States, Britain and Europe, all of which have held Aboriginal skeletons for study or display.

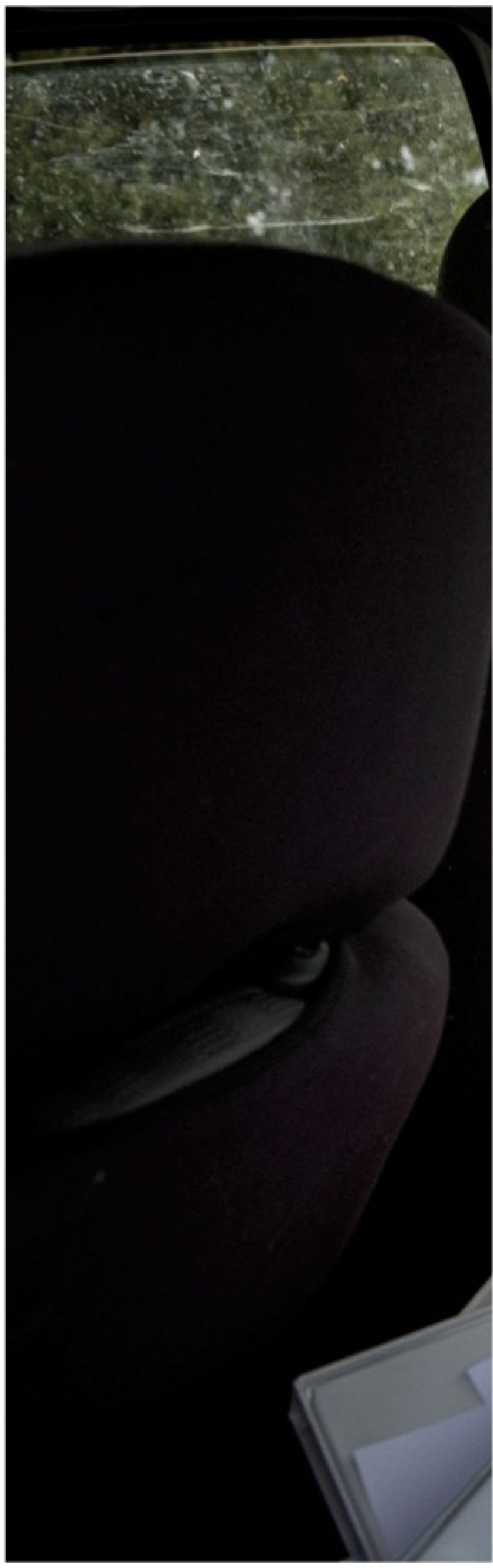
"We had 3,000 individuals, all indigenous, in the '80s," Pickering marveled. "Rooms full of bones." Locating the Aboriginal communities to return them to involved serious detective work. Many of the skeletons were mixed up, their labels faded or eaten by silverfish, and their origins were only traced through century-old correspondence and fading ledgers.

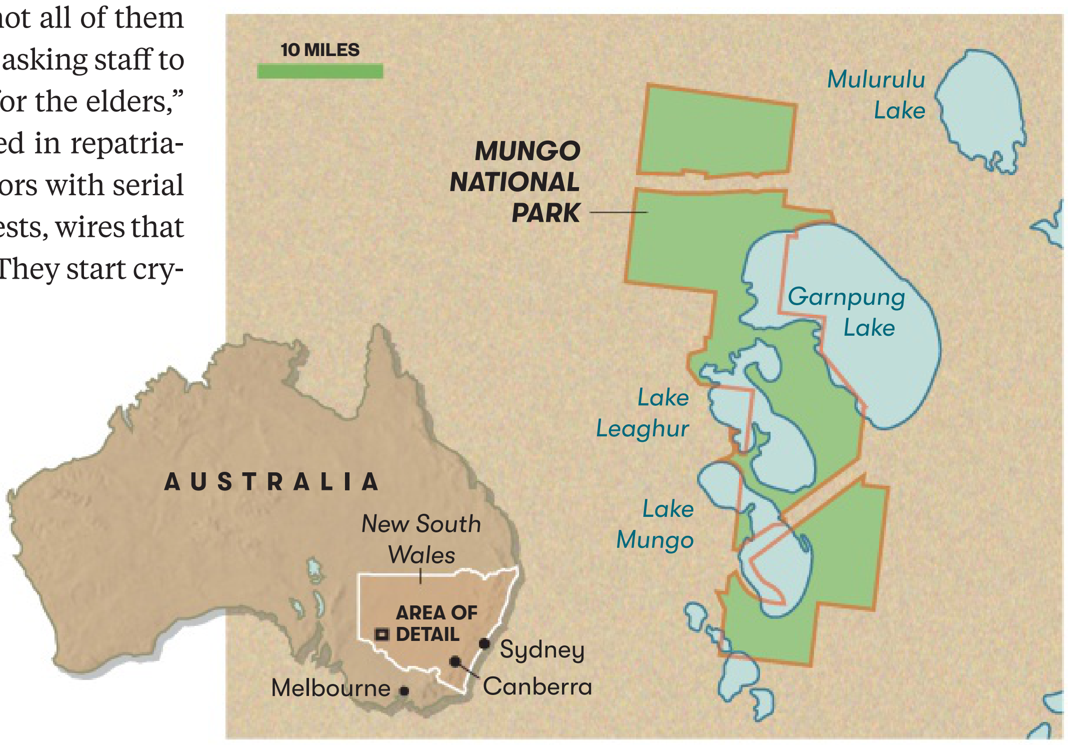
The unit's centerpiece is a table where skeletons are laid out for tribal elders, who wrap the remains in kangaroo skin or wafer-thin paperbark to take back to Country. But not all of them want to handle the remains, Pickering said, often asking staff to do it instead. "It can be a harrowing experience for the elders," says heritage officer Robert Kelly, who has worked in repatriation since 2003. "To see the skulls of their ancestors with serial numbers written on them, holes drilled for DNA tests, wires that were used for display mounts. They break down. They start crying when they see these things."

Although Mungo Man had never been displayed or seriously damaged by intrusive scientific tests, emotions ran high in the lab on the morning of November 14, 2017, when his bones were carefully placed in the casket here for his funeral procession to the west. The first ceremony was held, of all places, in the storage facility's parking lot, near the vintage hearse, its doors marked with the red, black and yellow of the Aboriginal flag. War-



The skeleton of Mungo Man as it appeared during excavation in 1974. The bones would spend the next 43 years at the Australian National University in Canberra.





JIM BOWLEN ;MAP: GUILBERT GATES

Jim Bowler, who discovered Mungo Man's remains, often uses his truck for an office.

ren Clark, an elder from the Paakantyi tribal group, surveyed the bare asphalt expanse during his speech. "This is not home for me, it's not home for our ancestors, either," he said, "and I'm sure their spirits won't rest until they are buried back on our land. Our people have had enough. It's time for them to go home."

* * *

LAKE MUNGO'S remoteness is central to its appeal to travelers. "Only people who are really interested will get there," said Rosendahl of the World Heritage office. He wasn't exaggerating: The journey still qualifies as an outback adventure. My jumping-off point was the isolated mining outpost of Broken Hill, which I reached in a small propeller plane packed with engineers. At first, the town felt like a time warp. An enormous slag heap looms as a reminder of its heyday in the early 1900s as the world's largest producer of lead, zinc and silver. Monstrous trucks carrying livestock rumble down the main street. Buildings—old butcher shops, trade union clubs, barbers—sport Wild West-style verandas with ornate iron lace. But the retro illusion was punctured as soon as I checked into the Palace Hotel, a Victorian pub that was taken over in the 1970s by an Italian immigrant who fancied himself a painter and used every interior surface as a canvas, including the ceilings. The hotel pub was a set for the 1994 film *The Adventures of Priscilla, Queen of the Desert*, about a trio of drag queens touring the outback. Ever since, it has been a pilgrimage site for gay men, hosting weekly transvestite shows. Today, the crusty mineworkers in flannel shirts and broad-rimmed hats nursing their beers at the bar nod amiably to the technicolor blur of buffed men streaming by in sparkly sequins, wigs and feathers.

My guide was a U.S.-raised artist named Clark Barrett, who moved to Broken Hill 40 years ago so he could fall off the map. “I wanted to live somewhere I could see the rotation of the earth,” he explained as we hit the road in a 4x4. He still camps in the desert for weeks at a time, painting and observing the sky and stars. (“The rotation of the earth makes my day” is his favorite joke.) Outside Broken Hill, the unpaved highway sliced without a single curve across the lonely, existential landscape, which was given a degree of notoriety by another Aussie movie, *Mad Max 2*. Mile after mile of flat scrub was interrupted only by the occasional tree rising like a stark sculpture, a mailbox fashioned out of an eight-gallon drum, or a silent township with little more than a gas station. We were closely monitoring the weather. Rain had fallen the night before and threatened to turn the road into a slippery morass.

This was mythic Australia, and far from lifeless. “Mobs” of kangaroos bounded by, along with strutting emus. Shingleback lizards, with shiny black scales resembling medieval armor and garish blue tongues, waddled onto the road. The native bird life was raucous, brilliant colored and poetically named—lousy jacks, mulga parrots, rosellas, willy wagtails and lorikeets.

By the time we reached the turnoff to Mungo National Park, the bars on our cellphones were down to zero. We screeched to a halt before the only accommodation, a desert lodge with lonely cabins arranged in a circle. The only sound was the wind moaning through the pine trees. At night, beneath the brilliant swath of the Milky Way, total silence fell. The sense of entering another era was palpable—and mildly unnerving.

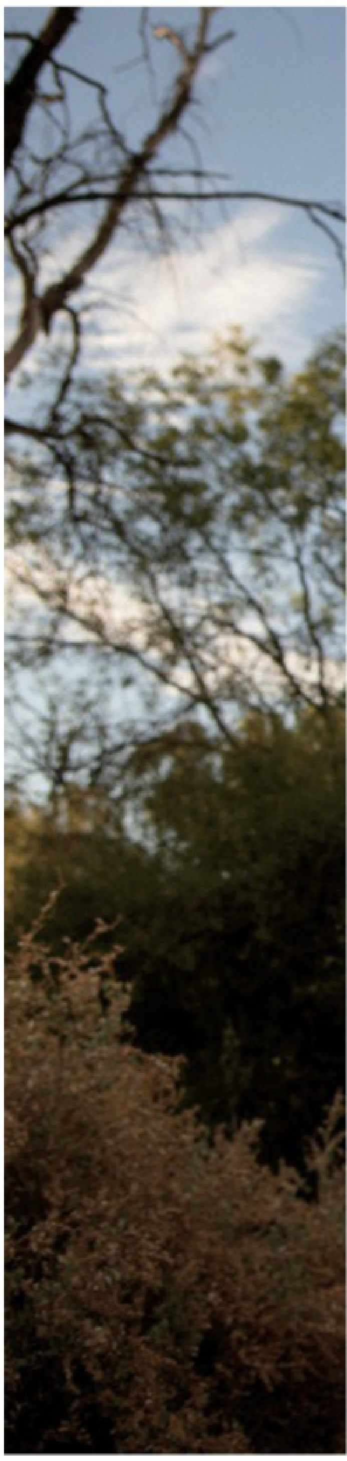
“I BRUSHED AWAY THE SAND AND THERE WAS A MANDIBLE, WHICH MEANT THE REST OF THE BODY MIGHT BE IN THE GROUND.”

* * *

WHEN MUNGO MAN WALKED this landscape some 40,000 years ago, the freshwater lake was around 25 feet deep, teeming with wildlife and surrounded by forests dappled with golden wattle. Like the rest of Australia, it had once been the domain of megafauna, a bizarre antipodean menagerie that had evolved over the 800 million years of isolation before the Aboriginal hunter-gatherers arrived. There were enormous hairy wombats called Diprotodons that weighed over two tons, towering flightless birds called Genyornis, and Macropus titan, a nine-foot-tall kangaroo. The megafauna’s fate was sealed when *Homo sapiens* landed on the Australian coast sometime between 47,000 and 65,000 years ago. Scientists believe that around 1,000 sapiens traveled by boat from Indonesia—just 60 miles away then, thanks to low ocean levels—to become the first human inhabitants of Australia. Scholars now regard the sea voyage as a major event in human history: It was “at least as important as Columbus’ journey to America or the Apollo 11 expedition to the moon,” according to historian Yuval Noah Harari in *Sapiens: A Brief History of Humankind*. The latest scientific theories suggest the megafauna were hunted to extinction by the newcomers and had disappeared by the time of Mungo Man. But the landscape was still bountiful, an Aussie Garden of Eden: Middens reveal that residents harvested fish, mussels and yabbies (freshwater crayfish) from the lake waters, and trapped small marsupials, collected emu eggs and grew sweet potato.

The following millennia saw climate change on an epic scale. The last ice age began 30,000 years ago; by the time it had ended, 18,000 years ago, the melting ice caps had made Australian coastal water levels rise 300 feet, creating its modern outline. The interior lakes around Willandra (there are actually 19 of them) dried out and emptied; along each one’s eastern flank, the relentless outback winds created the crescent-shaped mountain of sand called a “lunette.” Arid though the landscape was, the nomadic Aboriginal groups, the 3TTGs, knew how to live off the desert and continued to use it as a regular meeting place.

But the speed of change accelerated exponentially after the first British settlement was founded in Syd-



Mary Pappin, an elder with the Mutthi Mutthi tribe, campaigned for the repatriation of Mungo Man.

ney in 1788. It was a cataclysm for Australia's first inhabitants. Within a few short decades, British explorers were arriving in the Willandra area, followed by streams of white settlers. In the 1870s, colonial police forcibly moved Aboriginal people off the land into reserves and religious missions, and farmers carved out stations (ranches). Aboriginal culture was dismissed as primitive; the few British scientists who considered the Aboriginal people believed they had landed relatively recently. Some 50,000 sheep were sheared annually at the station named after St. Mungo by its Scottish founders, and their hoofs stripped the top soil from the dry lake floor. Imported goats devoured native trees; imported rabbits riddled the earth with their burrows; and vulnerable marsupials like the pig-footed bandicoot and the hairy-nosed wombat vanished. The sand kicked up by the sheep began to scarify one lunette, stripping the native vegetation that bound it together. The sand arc was a scenic oddity dubbed the Walls of China, possibly by Chinese laborers.

A cast replica of a 21,000-year-old footprint found with others near Lake Mungo in 2003. They are the largest set of ice age footprints in the world.

As late as the 1960s, the region was still so little known to white Australians that the lakes had no names. It was simply left off maps until a geomorphology professor flew from Broken Hill to Melbourne in 1967 and looked out the window. He saw the pale shapes in the desert below and recognized them as fossilized lake beds. Back at the Australian National University (ANU) in Canberra, he suggested to a middle-aged student, a soulful geologist working on ancient climate change in Australia, Jim Bowler, to investigate. Bowler had no idea that the visit would transform his life.

* * *

NOW 88 AND A LEGEND in Australia, Bowler lives in Brighton, a tidy seaside suburb of Melbourne, a city of Victorian monuments once considered the most stolidly "British" in the Antipodes. When I poked my head into Bowler's bungalow, his wife, Joan, was surprised I hadn't seen him sitting across the road inside his pickup truck, where he likes to work. “He’s a bit strange,” she said, shaking her head as she led me up the driveway. “But I suppose all academics are.”

Bowler was indeed sitting in the front seat of a silver Nissan, tapping away on his laptop and surrounded by a chaos of notes, pens and electrical cords. “This is the only place I can get a little peace,” he laughed. Although he has long been a university professor, his lanky frame and sun-beaten skin were reminders of his youth farming potatoes and mustering cattle in the Snowy Mountains, as well as his decades working as a field geologist in some of Australia’s harshest corners. He was dressed as if he were about to head out on safari any minute, with a khaki Bushman’s vest and an Akubra hat by his side, although his white chin beard gave him the air of an Edwardian theologian. (He studied for a time to be a Jesuit priest.) Bowler suggested I clear some space and hop into the passenger seat so that we could drive around the corner to Port Phillip Bay. There, sitting in the car and gazing at seagulls over the beach, he conjured the outback.

Bowler first went to Lake Mungo in 1968 to map ice age geology. “I could see the impact of climatic change on the landscape,” he explained. “The basins were like gauges. But if you follow water, you follow the story of human beings. Inevitably, I found myself walking in the footsteps of ancient people.” Bowler realized that the exposed strata of the lunettes created an X-ray of the landscape over the last 100 millennia. He spent weeks exploring on a motorbike, naming the lakes and the major geological layers after sheep stations: Gol Gol, Zanci, Mungo. “All sorts of things were popping out of the ground that I had not expected to see,” he recalled. “I would find shells and stone flakes that looked transported by humans.” The strata placed them at well over 20,000 years old, but archaeologists wouldn’t believe him: The conventional wisdom was the Aboriginal people arrived in faraway northern Australia 20,000 years ago at the earliest.

His first discovery—a skeleton that would be dubbed “Mungo Lady”—was, in retrospect, a haphazard affair. On July 15, 1968, Bowler spotted charcoal and bone fragments by Mungo’s shoreline, but the news was greeted with indifference back at ANU. It took eight months before he and two colleagues wangled a research grant—$94 to cover fuel for a VW Kombi bus and two nights in a motel. When the trio cleared away the sand, “out dropped a piece of cranium,” Bowler recalls. Then came part of a jawbone, followed by a human tooth. The body had been burned, the bones crushed and returned to the fire.

After they carried the bones back to Canberra in a suitcase, one of the party, an ANU physical anthropologist named Alan Thorne, spent six months reconstructing the skull from 500 fragments. The result proved beyond doubt that this was *Homo sapiens*—a slender female, around 25 years old. The discovery coincided with the pioneering days of “new archaeology,” using scientific techniques such as carbon dating (which measures carbon-14, a radioactive isotope of organic matter) to place artifacts in specific time frames. When Mungo Lady was dated at 26,000 years, it destroyed the lingering 19th-century racist notion, suggested by misguided followers of Charles Darwin, that Aboriginal people had evolved from a primitive Neanderthal-like species.

But it was Bowler’s discovery of Mungo Man five years later that made world headlines. On February 26, 1974, by now doing his PhD, he was again at Lake Mungo when unusually torrential summer rains hit. “There was a pristine new surface on the dunes,” he recalls. He went back to where he had found Mungo Lady and followed the same geological “horizon.” He spotted white bone. “I brushed away the sand and there was a mandible, which meant the rest of the body might be in the ground.” He rushed to find a telephone in the nearby homestead. “Happily, it worked! We were 100 miles from any other building.”

This time, ANU archaeologists hurried to the scene. They only had to smooth the sand away to find an intact male skeleton. He had been ceremoniously buried; his hands were folded over the pelvis and traces of red ocher enveloped him from cranium to loin. The ocher had been carried a great dis-

EPILOGUE FOR THE ANCESTORS

Smithsonian researchers forge a new policy for returning human remains to indigenous people overseas

TODAY THE SMITHSONIAN’S NATIONAL MUSEUM OF NATURAL HISTORY (NMNH) cares for collections made by the American-Australian Scientific Expedition to Arnhem Land of 1948. A collaboration among Australian institutions, the Smithsonian and National Geographic, the ten-month venture yielded thousands of biological specimens and cultural items, which are still being studied today. The Aboriginal bark paintings commissioned by the researchers sparked global awareness of this art form. For decades the remains of over 40 Aboriginal individuals were kept at NMNH. By 2010, the museum, working with officials and indigenous groups in Australia, had returned the Arnhem Land remains on loan from the Australian government, and the museum is working closely with Aboriginal groups to repatriate remains collected from other places in Australia. Returning the Arnhem Land remains to Australia, says Joshua A. Bell, curator of globalization, “helped us establish more formal guidelines for engaging in international repatriation.” **–EMILY TOOMEY**

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The 275,000-acre Mungo National Park is home to large numbers of kangaroos, emus and pink cockatoos.

tance—the nearest source was over 130 miles away—and had been either painted onto the body or sprinkled over the grave. “We suddenly realized this was a ritual site of extraordinary significance,” Bowler recalled. “It was a shock. You’re sitting in the sand and suddenly realize that something beyond you has happened.” The next surprise came when carbon dating put “Mungo Man” at 40,000 to 42,000 years old—some 5,000 years older than the Cro-Magnon sites in Western Europe. The researchers retested Mungo Lady; the new data showed that she had lived around the same time as Mungo Man.

The news revolutionized the timeline of human migration, proving that *Homo sapiens* had arrived in Australia far earlier than scientists imagined as part of the great migration from East Africa across Asia and into the Americas. Post-Mungo, the most conservative starting date is that our species left Africa to cross the Asian landmass 70,000 years ago, and reached Australia 47,000 years ago. (Others suggest the Aboriginal arrival in Australia was 60,000 years ago, which pushes the starting date of migration back even further.)

“IT FELT LIKE A BEGINNING, NOT AN END. IT WAS THE BEGINNING OF THE HEALING, NOT JUST FOR US, BUT FOR AUSTRALIA.”

Just as revolutionary was what Mungo Man meant for the understanding of Aboriginal culture. “Up until Mungo, Aboriginals had been frequently denigrated,” Bowler said bluntly. “They were ignorant savages, treacherous. Suddenly here was a new indication of extraordinary sophistication.” The reverent treatment of the body—the oldest ritual burial site ever found—revealed a concern for the afterlife eons before the Egyptian pyramids. Two of Mungo Man’s canine teeth, in the lower jaw, were also missing, possibly the result of an adolescent initiation ceremony, and there were the remains of a circular fireplace found nearby. “It took me a long time to digest the implications,” Bowler said. Today, Aboriginal people still use smoke to cleanse the dead. “It’s the same ritual, and there it was 40,000 years ago.” All the evidence pointed to a spectacular conclusion: Aboriginal people belong to the oldest continuous culture on the planet.

* * *

NEWS OF MUNGO MAN’S discovery, presented as a triumph by scientists, provoked outrage in the Aboriginal communities; they were furious that they had not been consulted about their ancestor’s removal from his homeland. “I read about it in the newspaper like everybody else,” recalls Mary Pappin, a Mutthi Mutthi elder. “We were really upset.” The first quiet protests over archaeological work had begun years earlier over Mungo Lady, led by her mother, Alice Kelly, who would turn up with other women at new digs and demand an explanation, carrying a dictionary so she could understand the jargon. “My mum wrote letters,” recalls her daughter. “So many letters!” Removing Mungo Man seemed the height of scientific arrogance. Tensions reached such a point by the end of the 1970s that the 3TTs placed an embargo on excavation at Lake Mungo.

Mungo Man surfaced precisely at a time when Australia was wrestling with a crisis in race relations that dates back to the colonial era. The first British settlers had mistakenly dismissed the Aboriginal people as rootless nomads, ignoring their deep spiritual connection to the land based on the mythology of the Dreamtime. An undeclared frontier war followed, involving massacres and enforced removals. Whites “harvested” Aboriginal skeletons, often by pillaging grave sites or even after bloodbaths, for study and display in museums in Britain, Europe and the States, in some cases to “prove” that indigenous races were lower on the evolutionary scale than Anglo-Saxons. The macabre trade continued in Australia until the 1940s (as it did for Native American remains in the U.S.); the last official expedition, a joint Australian-U.S. effort involving the Smithsonian Institution and others that would become controversial, occurred in 1948. Aboriginal people felt each removal as a visceral affront. (See “Epilogue for the Ancestors,” p. 46.)

This bleak situation began to change in the 1960s when, influenced by the civil rights movement and Native American campaigns in the States, Aboriginal activists demanded that they be given citizenship, the vote and, by the 1970s, ownership of their traditional homelands. The standoff between the 3TTGs and scientists began to thaw in 1992, when ANU agreed to return Mungo Lady to the traditional owners. Relations improved as young Aboriginal people were trained as rangers, archaeologists and heritage officials, and in 2007, the 3TTGs gained joint management of the parks. But an impasse remained over the fate of Mungo Man.

It was support from Jim Bowler that tipped the balance. In 2014, he wrote in a widely publicized editorial that he felt a responsibility to help Mungo Man go home. “I was clobbered!” he laughs now. “They said, ‘Bowler’s gone off tilting at windmills! He’s out there like Don Quixote.’ ” Scientists argued that the skeleton should be kept safe, since future developments in DNA research and improved X-ray tests might one day reveal new insights about the diet, life expectancy, health and cultural practices of early humans, or about mankind’s origins. (Did *Homo sapiens* evolve from a single “African Eve” or develop in separate locations? Did our species overwhelm the other known human species such as *Homo neanderthalensis* and *Homo erectus*, or interbreed with them?)

The process of returning Aboriginal remains sped up in 2002, when the Australian government recommended that repatriations be "unconditional." Unlike in the U.S., where federal laws govern the return of Native American remains, the directive had no legal force; nevertheless, Australian institutions responded with arguably more energy. A network of heritage officers began systematically connecting with Aboriginal communities all over Australia to empty museum collections. "We try to be proactive," says Phil Gordon, project manager for repatriation at Sydney's Australian Museum. "People also do contact us. They call you up on the phone: 'Hey! You got any of my ancestors?'"

Mungo Man's return was the climax of this anti-colonial shift. "It's about righting the wrongs of the past," says Aboriginal heritage officer Kelly, who wrote the formal letter asking for Mungo Man's return. Michael Pickering in Canberra was one of many older white Australian museum workers who have seen a complete reversal of attitudes in their lifetimes. "If you'd asked me at age 22," he admitted, "I would have said it was a crime against science. But now I'm older and wiser. Science is not a bad thing. But society benefits from other forms of knowledge as well. We learn so much more from repatriation than letting bones gather dust in storage."

All these emotions came together in November 2017 as the hand-carved casket was laid out at Lake Mungo and covered with leaves. As the smoking ceremony began, recalls Jason Kelly, a willy willy (dust devil) swept from the desert and across the casket. "It was the spirit of Mungo Man coming home," he said. "It felt like a beginning, not an end. It was the beginning of the healing, not just for us, but for Australia."

"MUNGO MAN AND MUNGO LADY, YOU DIDN'T FIND THEM. THEY FOUND YOU!" THEY HAD MESSAGES TO DELIVER.

* * *

TODAY, MUNGO MAN, whose bones were returned to the Aboriginals, lies in an interim "secret location" awaiting reburial, which will probably occur sometime next year. When I went to the park visitor's center, a ranger pointed to a door marked "Staff Entrance Only." "He's down the back," he confided. "But don't worry, mate, he's safe. He's in a bank vault." When he started showing visitors on a map the spot where the bones were found by Jim Bowler, the ranger next to him rolled his eyes and muttered, "You're not supposed to tell people that!"

The human presence may have elements of an Aussie sitcom, but the landscape is among the eeriest in the outback. At dusk, I climbed the Walls of China, crossing the rippling Sahara-like dunes and skirting the ribs of a wombat and shards of calcified tree trunk among the craggy spires. Although only 130 feet high, the dunes tower over the flat desert. Peer-

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The spectacular "Walls of China" formation, an age-old series of lunettes on the eastern side of Lake Mungo, stretches over 20 miles and rises to 130 feet.

ing to the south, where Mungo Man and Mungo Lady had both emerged from the sand, I tried to grasp what 42,000 years actually meant. The Roman Empire ended roughly 1,500 years ago, Troy fell 3,200 years ago, the Epic of Gilgamesh was written around 4,000 years ago. Beyond that, time unraveled.

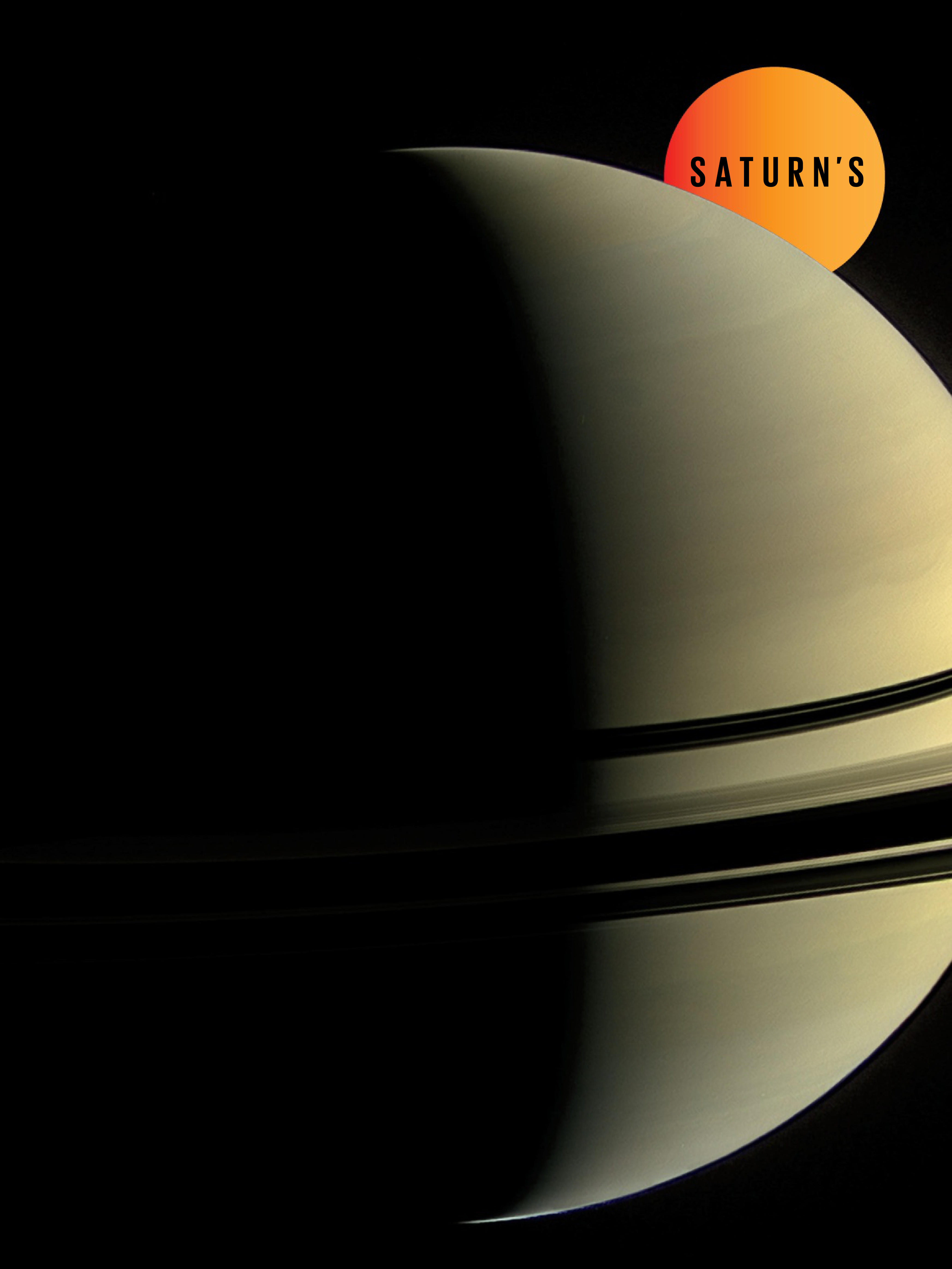
I finally made the mental leap into prehistory when I found myself on a hunt with an ice age family. In 2003, a young Aboriginal ranger, Mary Pappin Jr. (granddaughter of the activist Alice Kelly), made an astounding discovery near Lake Mungo: more than 560 footprints, later shown to be around 21,000 years old. This miraculous snapshot of Pleistocene life featured 12 men, four women and seven children who had walked across the soft clay around the lake, which dried like concrete in the sun. The foot impressions were then immersed in drifting sands and preserved.

The footprints look as if they were made yesterday. Analysis by expert trackers reveals that the group, presumably an extended family, was moving at the steady pace of long-distance runners. The men were mostly on the outside of the group, perhaps in hunting formation; at one point, they paused and rested their spears. The tallest male, the forensic analysis suggests, was 6-foot-6 with size 12 feet. It seems that one man had lost a leg and hopped without the aid of a crutch. Another of the adults was walking at a slower pace with children—one wonders what they were talking about. Suddenly the millennia evaporated.

* * *

IF EVEN A CASUAL visitor can have cosmic flashes in this otherworldly setting, Jim Bowler has come to feel he was guided by a higher force to Lake Mungo. "The unlikely probability of being there just when Mungo Man's skeleton was starting to appear—and find things thoroughly intact!" he laughs. "It's one in a million." As he approaches 90, he is racing to complete a book that will connect his personal narrative to larger issues. "Mary Pappin told me: 'Mungo Man and Mungo Lady, you didn't find them. They found you!'" he says. They had messages to deliver, such as telling white Australians that the time has come to acknowledge the injustices inflicted upon Aboriginal people.

Bowler, the doctor of geology and the lapsed Jesuit, also wants Western culture to appreciate the indigenous worldview: "Do we have something to learn from Aboriginal people?" he asks. "And if so, what?" On sleepless nights he asks for guidance from Mungo Man himself. "Aboriginal people have a deep spiritual connection to the land. The ocher Mungo Man was buried in was a link to the cosmos. Western culture has lost these connections." The use of stories and myths by Aboriginal people, Native Americans and other indigenous groups also satisfies deep human longing for meaning. "Science has trouble explaining mysteries. There's an entire reality beyond the scientific one." ◆

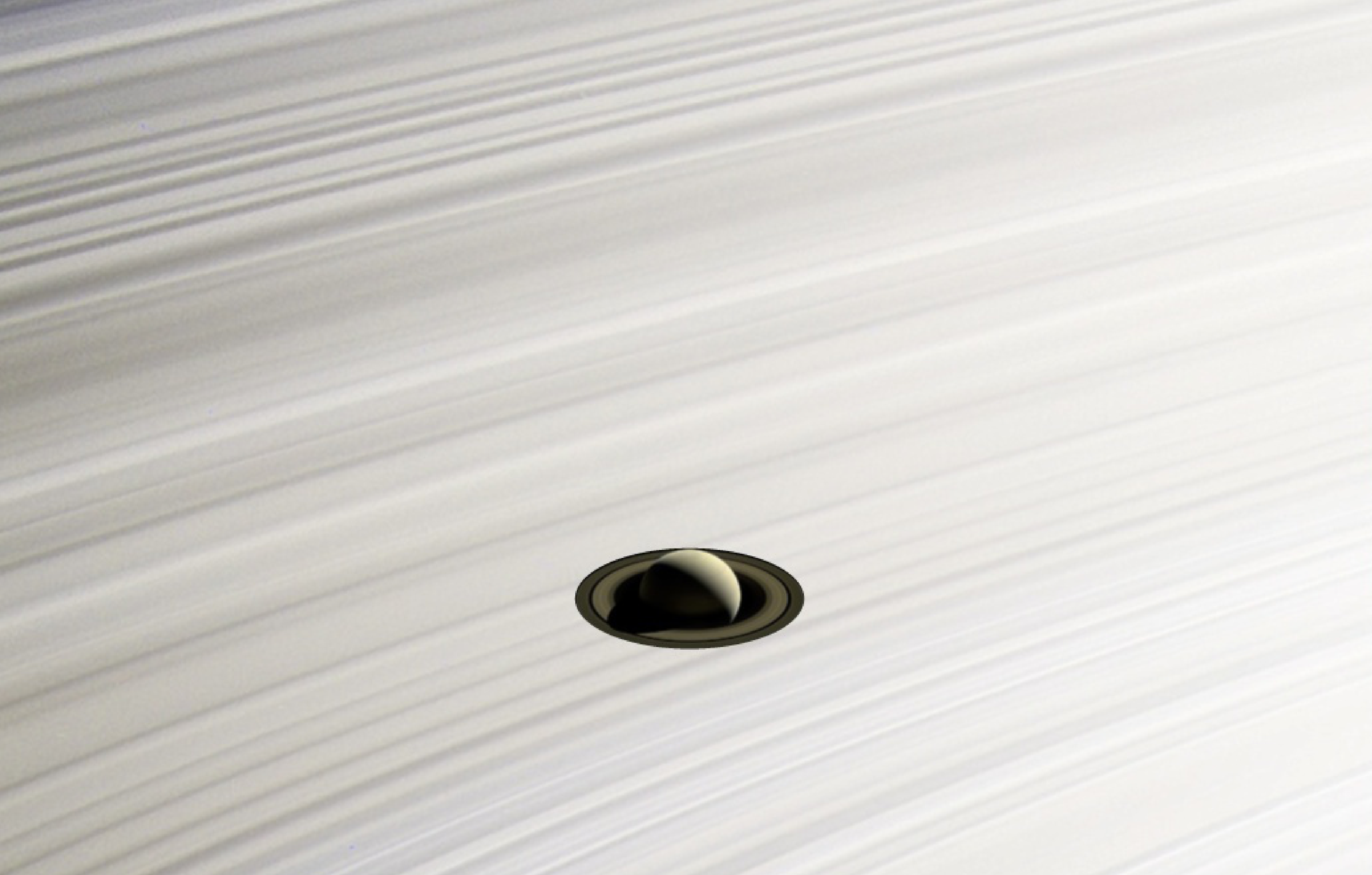


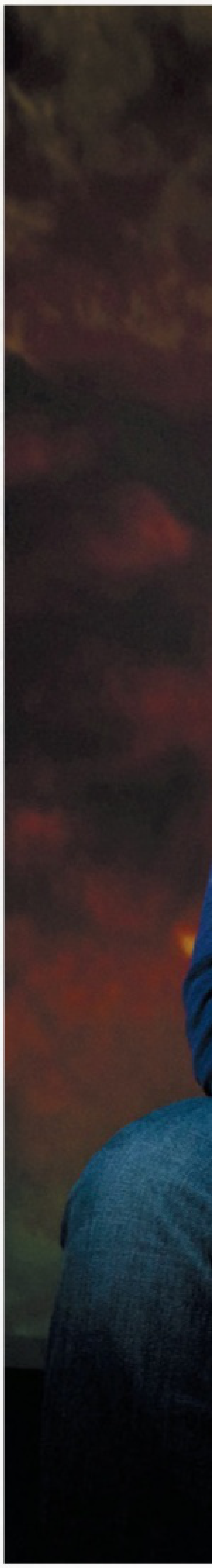
SATURN'S

THE PLANET'S DISTINCTIVE RINGS MAY BE GONE IN A COSMIC BLINK OF AN EYE

by
Shaun Raviv

SURPRISE





If someone asked you to draw a planet other than ours, you would likely draw Saturn, and that is because of its rings. But for most of history, human beings couldn't see the rings. Not the astronomers of ancient India, Egypt, Babylon or the Islamic world. Not Ptolemy or the Greco-Romans, who nonetheless discerned that Saturn was farther from Earth than Mercury or Venus. Not Nicolaus Copernicus, who showed that the Earth was just another planet orbiting the Sun. And not even Tycho Brahe, the Danish nobleman and alchemist, who attempted to calculate Saturn's diameter (he was way off).

It was Galileo Galilei who first spotted something there. His primitive telescope gave him only a slightly better view of the heavens than did the naked eye, and in 1610 he thought he saw two undiscovered bodies flanking Saturn, one on each side. "The fact is that the planet Saturn is not one alone," he wrote to a counselor of the Grand Duke of Tuscany, "but is composed of three." Two years later, though, with the rings tilted directly toward the Sun edgewise and basically invisible from Earth, Galileo was astonished to find that the two mysterious companions were gone. "What is to be said concerning so strange a metamorphosis?" he wondered.

The best minds of the 17th century came up with all sorts of theories: Saturn was ellipsoidal, or surrounded by vapors, or actually a spheroid with two dark patches, or had a corona that rotated with the planet. Then, in 1659, the Dutch astronomer Christiaan Huygens first made the suggestion that Saturn was surrounded by "a thin, flat ring, nowhere touching, and inclined to the ecliptic." The Italian-French astronomer Giovanni Cassini went a step further in 1675 when he noticed a puzzling slim, dark gap almost in the middle of the ring. What appeared to be one ring turned out to be even more complex. Astronomers now know that this "ring" is actually made up of eight main rings and thousands of other ringlets and divisions. Some of

PP. 50-53: NASA (3); EVELYN HOCKSTEIN

Not just a ringmaster, James O'Donoghue also studies Jupiter's Great Red Spot and the effects of solar winds on the auroras at Saturn's poles.

the rings have full-on moons roaming within them.

It took Cassini and Huygens again to make the first direct measurements of the rings. Not the men but the $4 billion NASA Cassini-Huygens mission that was launched in 1997 and orbited Saturn and its moons until 2017. The spacecraft confirmed that the rings are made up mostly of water ice—chunks ranging in size from submicroscopic particles to boulders dozens of feet wide. They stay in orbit around Saturn for the same reason the Moon stays in orbit around the Earth: Their speed is fast enough to just barely counteract the gravitational pull of the planet, keeping them at a distance. The ice particles fall into a ring shape because each one follows a similar orbital path. The particles in the inner rings move faster than those in the outer rings, because they are fighting against a stronger gravitational pull.

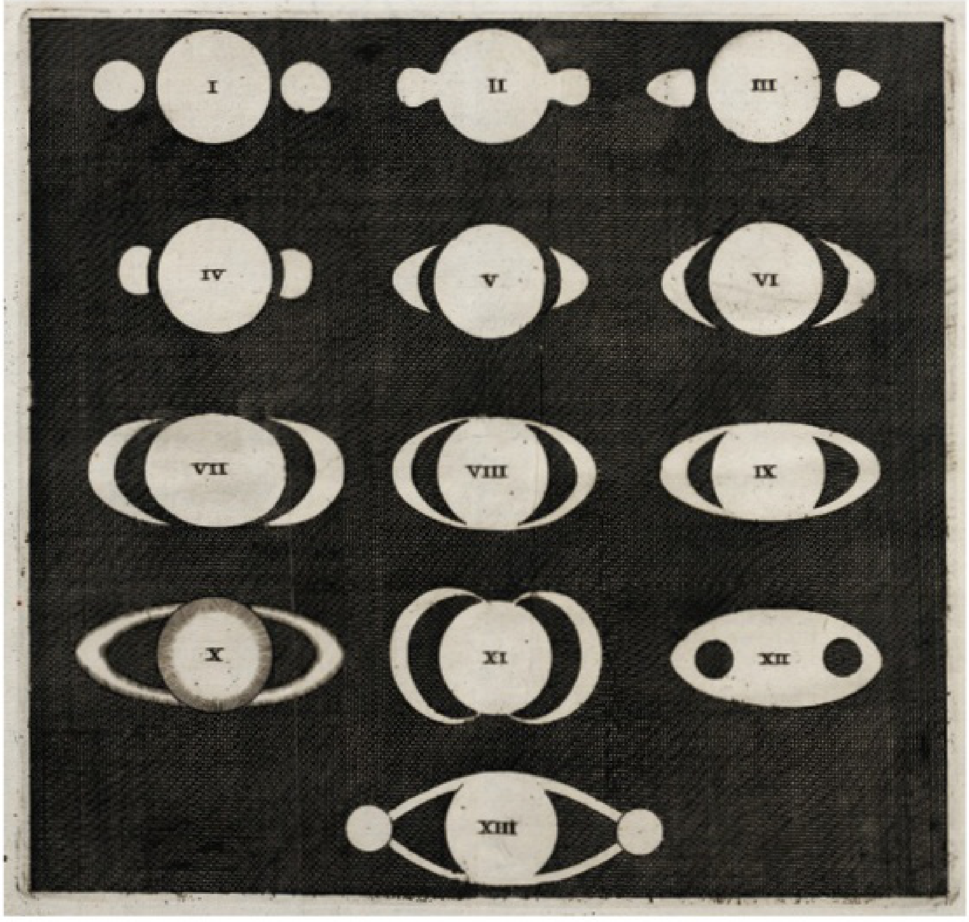
The rings have such a wide breadth their outermost circumference is greater than the distance from Earth to the Moon. But they're so thin that during Saturn's equinoxes, when the light from the Sun hits the rings straight on, they all but disappear when viewed from the Earth. The average thickness of the main rings is believed to be no more than 30 feet. A recent study showed that parts of the B-ring—the brightest ring of all—are only three to ten feet thick.

Astronomers have long wondered about the origins of Saturn's rings. Some believed they appeared when the planet first pulled itself together about 4.5 billion years ago. Others thought they were formed by colliding moons, asteroids, comets or even the remainders of dwarf planets, perhaps as recently as ten million years ago. But there seemed to be little serious interest in the question of how long they would last. Most of Saturn's rings lie within what's known as the Roche limit—the distance a satellite can orbit a large object without the planet's tidal force overpowering the object's own gravity and tearing it apart. (Saturnine rings that lie outside the Roche limit stay together because of the gravitational influence of other satellites, such as moons.) If the rings had stayed intact so far, most people reasoned, it seemed unlikely that they'd suddenly start disintegrating.

Then, in the summer of 2012, a 26-year-old doctoral candidate named James O'Donoghue was sitting in a nondescript lab at the University of Leicester in England. He'd been assigned to look at Saturn's auroras—the light shows around its poles. He was focusing in particular on a form of hydrogen called H3+, a highly reactive ion with three protons and two electrons. H3+ plays a role in a wide range of chemical reactions, from the creation of water and carbon to the formation of stars. As O'Donoghue puts it, "Every time we look at H3+, it helps us uncover some cool, crazy physics."

O'Donoghue enjoyed working late, sitting there in his jeans and T-shirt when everyone else had gone home for the night. He got up occasionally to make another cup of tea, then sat down again and stared at the black-and-white spectral images on his screen, which he described as looking "like white noise."

He hadn't planned on analyzing regions other than the poles, since nobody expected the H3+ to be doing anything interesting anywhere else on the



Renderings of Saturn's rings by different 17th-century scientists, starting with Galileo, who saw what looked like "ears" on either side of the planet.

planet. But for the heck of it, O'Donoghue decided to take a close look at other latitudes, away from the poles. To his surprise, he saw distinct bands of H3+—not just the uniform sameness he had expected. "Puzzled, and definitely not believing the result yet," O'Donoghue recalls, "I spent the next few days trying to confirm the banded pattern was real and not some computer coding error."

A few days later, O'Donoghue was in the office around midnight when it hit him that what he had seen was real. "It is an unnatural experience to be sitting alone in your dead-quiet office and all of a sudden feeling your heart start racing in a way only sprinting could explain, and all over a fuzzy-looking set of data points!" he told me. "I thought it could be some new band of aurora which had never been seen before or something entirely new. Those were the two options now, and both were amazing."

O'Donoghue wondered whether it could be a sort of weather phenomenon. But that seemed unlikely, if not impossible, since the bands were hundreds of miles above the cloud tops of Saturn. "The weather doesn't really go that high in that way," he said. The likeliest scenario was that something was traveling from the rings into the atmosphere. And since the rings are primarily made up of water ice, it meant that water was most likely raining down on Saturn. The implication was startling: One day, sooner than anyone expected, the rings could be gone.

It took O'Donoghue about ten days to convince his adviser that the observations pointed to something important. "Extraordinary claims require extraordinary evidence," O'Donoghue told me, reciting the old scientific adage. "And I was a rookie." So that night in the lab at Leicester was only the beginning. Over the next seven years, the world would learn that this young unknown British astronomer, who'd stumbled into academic science after a despairing childhood, had just made one of the biggest planetary discoveries in recent history.

I MET O'DONOGHUE A FEW MILES outside Washington, D.C., at NASA's Goddard Space Flight Center. We drove through the Goddard campus to Building 34—also known as the Exploration Sciences Building—and settled into a small lecture room. The whiteboard behind us had a colorful drawing of an anthropomorphic planet wearing protective eye goggles and next to it a caveat: "Not to any scale." Beside that someone had written, "Wow! Science!"

O'Donoghue, now 33, has spent time observing every planet in the solar system—plus the moon, stars, galaxies and supernovas—but he mostly focuses on the upper atmospheres of Jupiter and Saturn, the two gas giants. Compared with closer planets, Saturn has long been elusive, even for scientists. "Saturn doesn't give you many clues," he said. Scientists know quite a lot by now about Mars' cratered surface and carbon dioxide–dominated atmosphere, and the iron oxide dust that gives it its reddish color. Even Jupiter has its almost anatomical-looking bands, spots and colors, which show something about the forces and elements at work; for instance, Jupiter's light-colored zones are colder than its dark belts, and its Great Red Spot is a storm spinning counterclockwise. In contrast, says O'Donoghue, "Saturn is much colder, so those things literally freeze out. The banded structures you see on Jupiter sort of disappear on Saturn. It's just a golden yellow color." He paused. "It's nice to say 'golden.'" It would be more accurate to call Saturn a dull yellowish-brown.

Once O'Donoghue and his adviser, Tom Stallard, an associate professor of planetary astronomy at Leicester, agreed they were seeing distinct bands of H3+ at six unexpected latitudes on Saturn, the next step was to figure out what was causing them. Saturn's magnetic field lines provided a clue. Picture that experiment your high school physics teacher demonstrated. She put a rectangular magnet underneath a sheet of white paper and poured iron shavings on top. The shavings formed two flower-shaped lines that flowed into each other in a rounded pattern from each end, or pole, of the magnet. Like most planets, Saturn acts like a giant version of that experiment. Its magnetic field lines flow from inside one hemisphere of the planet, out into space, and round back into the other hemisphere.

Saturn's magnetic field lines also have a special quirk: They shift significantly to the north. The glowing bands O'Donoghue had noticed mapped almost precisely to where Saturn's magnetic field

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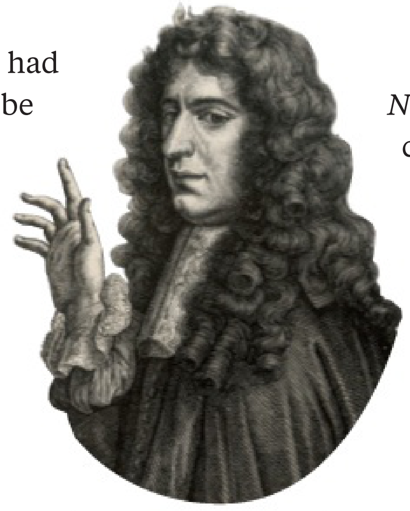
lines passed through three of its rings, and they had a northward shift—which meant they had to be related to the field lines. The likeliest scenario was that sunlight, as well as plasma clouds coming from tiny meteoroid strikes, was charging icy dust particles within the rings, allowing the magnetic fields to grab them. As the particles bounced and twisted along the lines, some of them got close enough to the planet that its gravity pulled them into the atmosphere.

What O'Donoghue didn't know then was that years earlier, in 1984, the astrophysicist Jack Connerney had coined the term "ring rain." Using data collected by the Pioneer and Voyager space probes between 1979 and 1981, Connerney described a haze of particles in specific locations, suggesting that material was coming down from the rings. (H3+ hadn't yet been detected in space.)

His idea didn't get much traction at the time. But when O'Donoghue and Stallard submitted their paper to the journal *Nature* in 2013, editors sent the manuscript to Connerney for his expert opinion. "I got this paper to review from the young guy. I didn't know who he was," Connerney said when I met him at Goddard. Connerney, who by then had spent years working on the Juno mission to Jupiter and the Maven mission to Mars, told O'Donoghue about his essentially forgotten paper.

"We hadn't heard of 'ring rain' before," O'Donoghue said, remembering his surprise. "It had been buried since the '80s."



Giovanni Cassini famously spotted a gap in what looked like a single giant ring around Saturn; he also discovered four of the planet's moons.

When O'Donoghue's paper was published in *Nature*, he was astonished by how quickly his life changed. News reporters from around the world bombarded him with interview requests. Prestigious astronomy centers courted him. This was quite a heady change for a guy who, only a few years earlier, had been working in a warehouse hauling crates, not yet sure how to escape the downward gravitational pull of his own bleak upbringing.

"I DON'T HAVE ONE OF THOSE normal stories where I was looking through a telescope when I was a kid," O'Donoghue told me. He envies colleagues who have those kinds of stories—the ones that look like Jodie Foster's in the movie *Contact*. Dark skies, a bright moon, an inspirational father who tells them to aim for the stars and never give up.

O'Donoghue's father left his life when he was 18 months old and never contacted him again. "Not even a birthday card," O'Donoghue told me. Until he was almost 10, he lived with his mother in Shrewsbury, England, a picturesque town on the River Severn where Charles Darwin was born. A large hill that some believe was the inspiration for J.R.R. Tolkien's Lonely Mountain—the dragon Smaug's lair—lies to the east. It was no fairy tale for young James. His mother's drug-addicted boyfriend became abusive, and so she and her son fled to a domestic violence shelter in Wales. "Everyone I knew before the age of 10½ or so was cut out," he said.

O'Donoghue was far from a star student, and physics was his worst subject.

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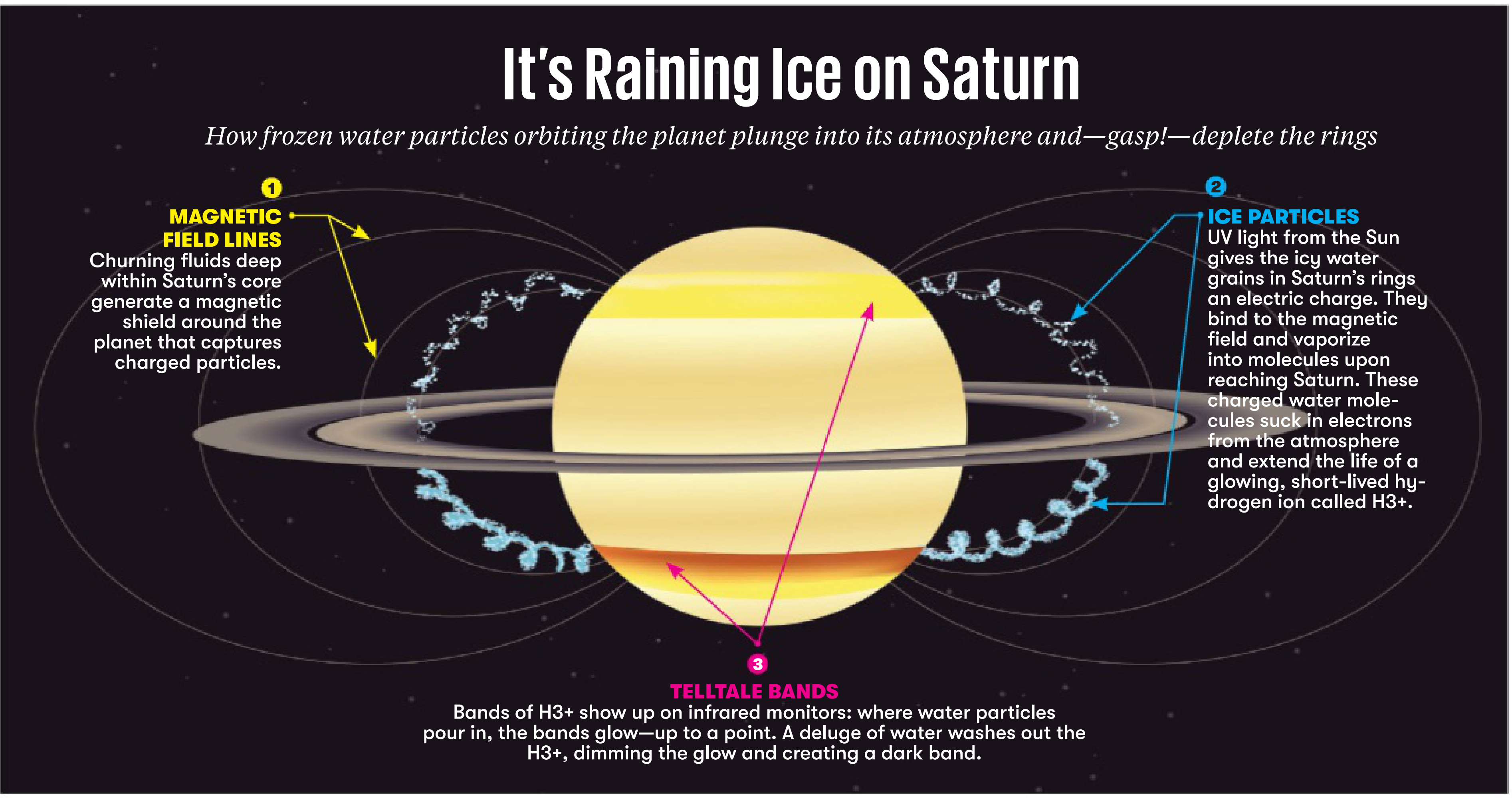


It's Raining Ice on Saturn

How frozen water particles orbiting the planet plunge into its atmosphere and—gasp!—deplete the rings

1 **MAGNETIC FIELD LINES**
Churning fluids deep within Saturn's core generate a magnetic shield around the planet that captures charged particles.

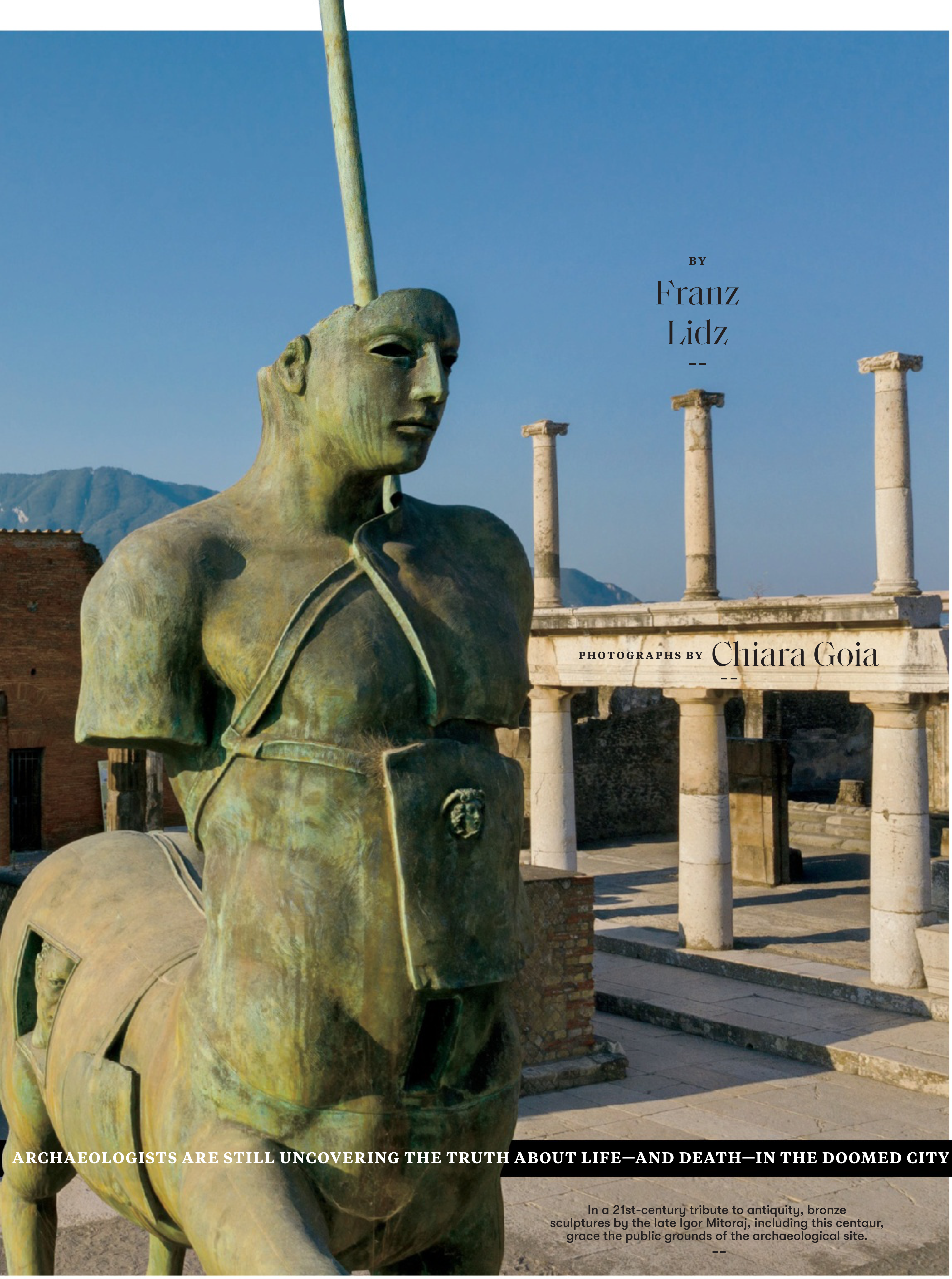
2 **ICE PARTICLES**
UV light from the Sun gives the icy water grains in Saturn's rings an electric charge. They bind to the magnetic field and vaporize into molecules upon reaching Saturn. These charged water molecules suck in electrons from the atmosphere and extend the life of a glowing, short-lived hydrogen ion called H3+.

3 **TELLTALE BANDS**
Bands of H3+ show up on infrared monitors: where water particles pour in, the bands glow—up to a point. A deluge of water washes out the H3+, dimming the glow and creating a dark band.

RECREATED GRAPHIC: ERITREA DORCELY; SOURCES: JAMES O'DONOGHUE; NASA'S GODDARD SPACE FLIGHT CENTER / DAVID LADD

THE NEW TREASURES OF POMPEII

FROM GORGEOUS ARTWORKS TO GRIMACING CORPSES,



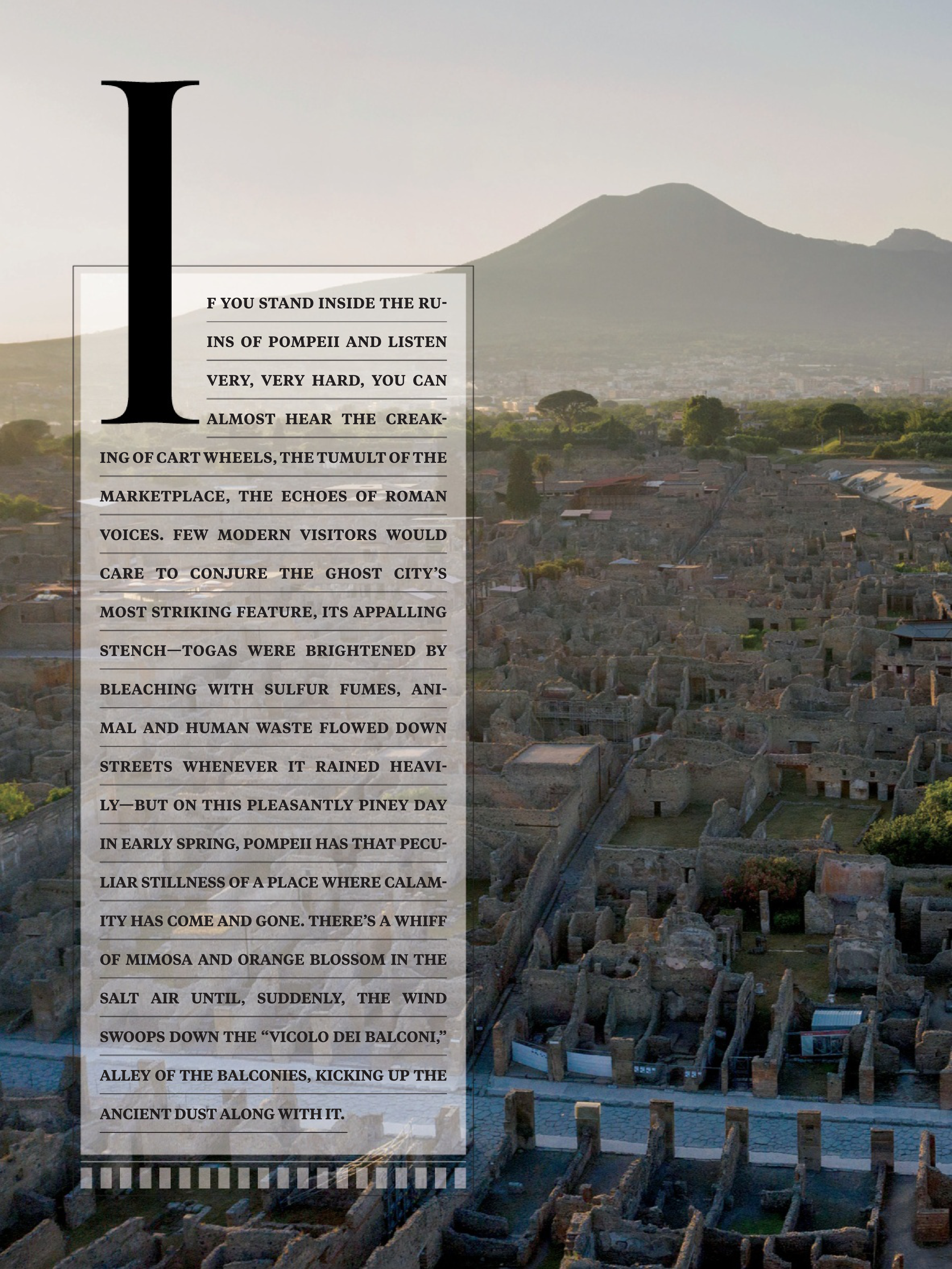
BY

Franz Lidz

PHOTOGRAPHS BY **Chiara Goia**

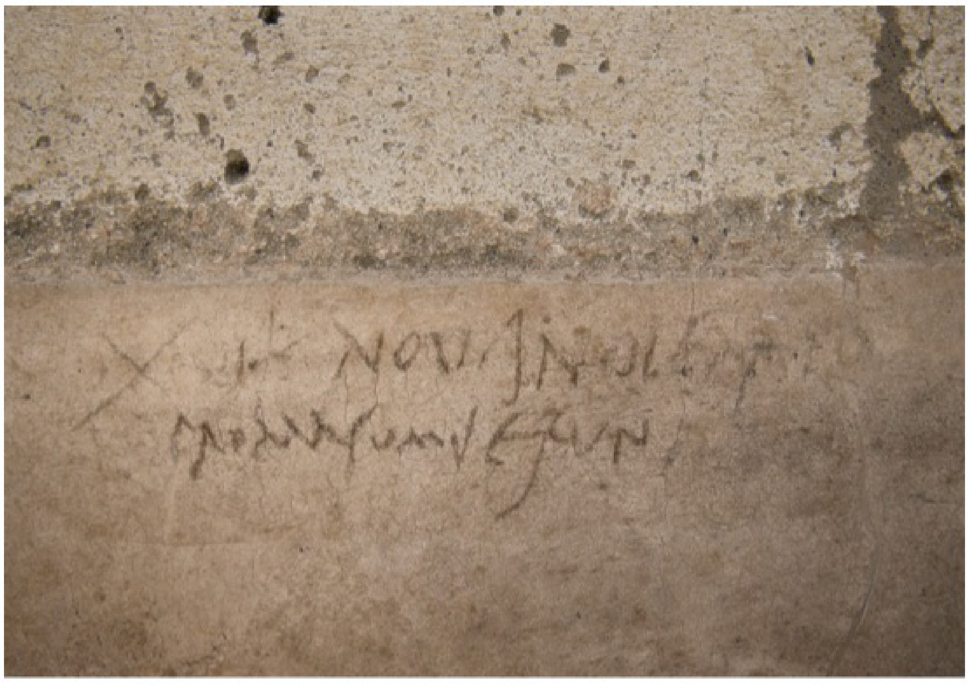
ARCHAEOLOGISTS ARE STILL UNCOVERING THE TRUTH ABOUT LIFE—AND DEATH—IN THE DOOMED CITY

In a 21st-century tribute to antiquity, bronze sculptures by the late Igor Mitoraj, including this centaur, grace the public grounds of the archaeological site.



IF YOU STAND INSIDE THE RUINS OF POMPEII AND LISTEN VERY, VERY HARD, YOU CAN ALMOST HEAR THE CREAKING OF CART WHEELS, THE TUMULT OF THE MARKETPLACE, THE ECHOES OF ROMAN VOICES. FEW MODERN VISITORS WOULD CARE TO CONJURE THE GHOST CITY'S MOST STRIKING FEATURE, ITS APPALLING STENCH—TOGAS WERE BRIGHTENED BY BLEACHING WITH SULFUR FUMES, ANIMAL AND HUMAN WASTE FLOWED DOWN STREETS WHENEVER IT RAINED HEAVILY—BUT ON THIS PLEASANTLY PINEY DAY IN EARLY SPRING, POMPEII HAS THAT PECULIAR STILLNESS OF A PLACE WHERE CALAMITY HAS COME AND GONE. THERE'S A WHIFF OF MIMOSA AND ORANGE BLOSSOM IN THE SALT AIR UNTIL, SUDDENLY, THE WIND SWOOPS DOWN THE "VICOLO DEI BALCONI," ALLEY OF THE BALCONIES, KICKING UP THE ANCIENT DUST ALONG WITH IT.

Vesuvius engulfed Pompeii, Pliny the Younger recalled, in darkness that was "as if the light has gone out of a room that is locked and sealed."



A charcoal inscription, newly uncovered, resets the eruption date from August to October, solving a mystery: Why did shops stock fresh autumn fare like chestnuts?

In A.D. 79, when Mount Vesuvius rumbled to life after being dormant for nearly 300 years, the alley was entombed and its balconies largely incinerated in the cascades of scorching ash and superheated toxic gases known as pyroclastic surges that brought instant death to the residents of Pompeii. Archaeologists discovered and unearthed the Vicolo dei Balconi only last year, in a part of the site called Regio V, which is not yet open to the public. The alleyway turned out to be lined with grand houses, some with intact balconies, some with amphorae—the terracotta containers used to hold wine, oil and *garum*, a sauce made from fermented fish intestines. Now, like nearly all the other scents of Rome's classical era, the once pungent garum is virtually odorless.

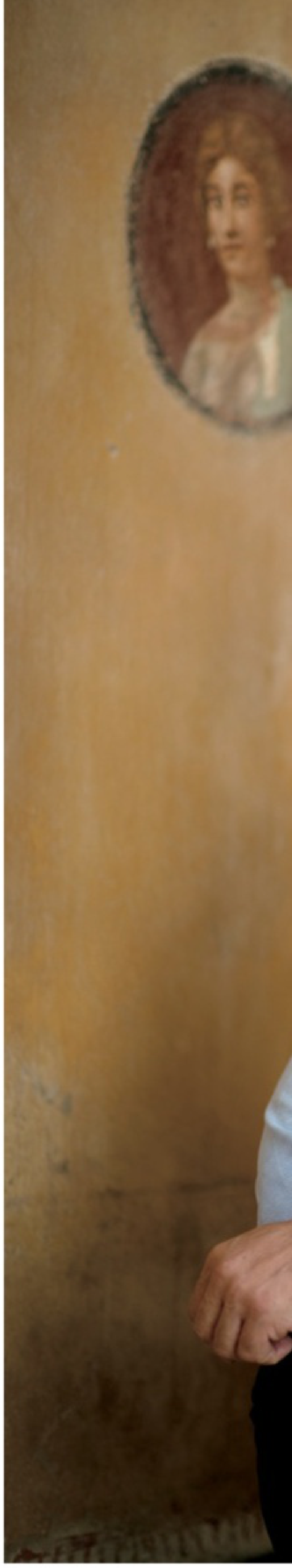
Part of the "Grande Progetto Pompei," or Great Pompeii Project, the $140 million conservation and restoration program launched in 2012 and largely underwritten by the European Union, the Regio V dig has already yielded skeletons, coins, a wooden bed, a stable harboring the remains of a thoroughbred horse (bronze-plated wooden horns on the saddle; iron harness with small bronze studs), gorgeously preserved frescoes, murals and mosaics of mythological figures, and other dazzling examples of ancient Roman artistry.

That's a surprisingly rich cache for what is arguably the most famous archaeological site in the world. But until now Pompeii has never been subjected to fully scientific excavation techniques. Almost as soon as the clouds of choking volcanic dust had settled, tunneling plunderers—or returning homeowners—grabbed whatever treasures they could. Even during the 1950s, the artifacts that researchers and others found were deemed more significant than the evidence of everyday life in the year 79. So far, the most explosive information to come out of this new excavation—one that will prompt textbooks to be rewritten and scholars to re-evaluate their dates—has no material value whatsoever.

One of the central mysteries of that fateful day, long accepted as August 24, has been the incongruity of certain finds, including corpses in cool-weather clothing. Over the centuries, some scholars have bent over backward to rationalize such anomalies, while others have voiced suspicions that the date must be incorrect. Now the new dig offers the first clear alternative.

Scratched lightly, but legibly, on an unfinished wall of a house that was being refurbished when the volcano blew is a banal notation in charcoal: "*in [d]ulsit pro masumis esurit[ions],*" which roughly translates as "he binged on food." While not listing a year, the graffito, likely scrawled by a builder, cites "XVI K Nov"—the 16th day before the first of November on the ancient calendar, or October 17 on the modern one. That's nearly two months after August 24, the fatal eruption's official date, which originated with a letter by Pliny the Younger, an eyewitness to the catastrophe, to the Roman historian Tacitus 25 years later and transcribed over the centuries by monks.

Massimo Osanna, Pompeii's general director and mastermind of the project, is convinced that the notation was idly doodled a week before the blast. "This spectacular find finally allows us to date, with confidence, the disaster," he says. "It reinforces other clues pointing to an autumn eruption: unripe pomegranates, heavy clothing found on bodies, wood-burning braziers in homes, wine from the harvest in sealed jars. When you reconstruct the daily life of this vanished community, two months of difference are important. We now have the lost piece of a jigsaw puzzle."



Massimo Osanna is restoring public faith in Pompeii after years of neglect; 3.5 million people visited in 2018, a million more than in 2012.

“I WAS 7 WHEN I FOUND **A SKULL IN THE NECROPOLIS** UNDER THE MEDIEVAL CHURCH IN THE CENTER OF TOWN.”

The robust campaign that Osanna has directed since 2014 marks a new era in old Pompeii, which earlier this decade suffered visibly from age, corruption, vandalism, climate change, mismanagement, underfunding, institutional neglect and collapses caused by downpours. The most infamous occurred in 2010 when the Schola Armaturarum, a stone building that featured resplendent frescoes of gladiators, keeled over. Giorgio Napolitano, Italy’s president at the time, called the incident a “disgrace for Italy.” Six years ago, Unesco, the United Nations agency that seeks to preserve the world’s most significant cultural assets, threatened to place Pompeii on its list of World Heritage sites in peril unless Italian authorities gave higher priority to protecting it.

The project has led to the opening, or reopening, of dozens of passageways and 39 buildings, including the Schola Armaturarum. “The restoration of the Schola was a symbol of redemption for Pompeii,” says Osanna, who is also a professor of classical archaeology at the University of Naples. He has assembled a vast team of more than 200 experts to conduct what he terms “global archaeology,” including not only archaeologists but also archaeozoologists, anthropologists, art restorers, biologists, bricklayers, carpenters, computer scientists, demographers, dentists, electricians, geologists, geneticists, mapping technicians, medical engineers, painters, plumbers, paleobotanists, photographers and radiologists. They’re aided by enough modern analytical tools to fill an imperial bathhouse, from ground sensors and drone videography to CAT scans and virtual reality.

At the time of the cataclysm, the city is said to have had a population of about 12,000. Most escaped. Only about 1,200 bodies have been recovered, but the new work is changing that. Excavators in Regio V recently uncovered skeletal remains of four women, along with five or six children, in the innermost room of a villa. A man, presumed to be somehow connected to the group, was found outside. Was he in the act of rescuing them? Abandoning them? Checking to see if the coast was clear? These are the sorts of riddles that have been seizing our imaginations since Pompeii was discovered.

The house in which this horror played out had frescoed rooms, suggesting that a prosperous family lived within. The paintings were preserved by the ash, streaks of which still stain the walls. Even in the current unrestored state, the colors—black, white, gray, ocher, Pompeii red, deep maroon—are astonishingly intense. As you step from room to room, over one threshold into another, finally standing in the spot where the bodies were found, the immediacy of the tragedy gives you chills.

Back outside on the Vicolo dei Balconi, I walked by archaeological teams at work and came across a freshly uncovered snack bar. This mundane convenience is one of some 80 scattered through the city. The large jars (*dolia*) embedded in the masonry serving-counter establish that this was a Thermopolium, the McDonald’s of its day, where drinks and hot foods were served. Typical menu: coarse bread with salty fish, baked cheese, lentils and spicy wine. This Thermopolium is adorned with paintings of a nymph seated on a sea horse. Her eyes seem to be saying "Hold the fries!"—but maybe that's just me.

As I walk the Roman street, Francesco Muscolino, an archaeologist who was kindly showing me around, points out the courtyards, election notices and, scratched into the outer wall of a home, a lewd graffito thought to be targeted at the last occupants. Though he cautions that even the Latin is practically unprintable, he tries his best to clean up the single entendre for a family readership. "This is about a man named Lucius and a woman named Leporis," he says. "Lucius probably lived in the house and Leporis appears to have been a woman paid to do something . . . erotic."

I later ask Osanna if the inscription was meant as a joke. "Yes, a joke at their expense," he says. "It was not an appreciation of the activity."

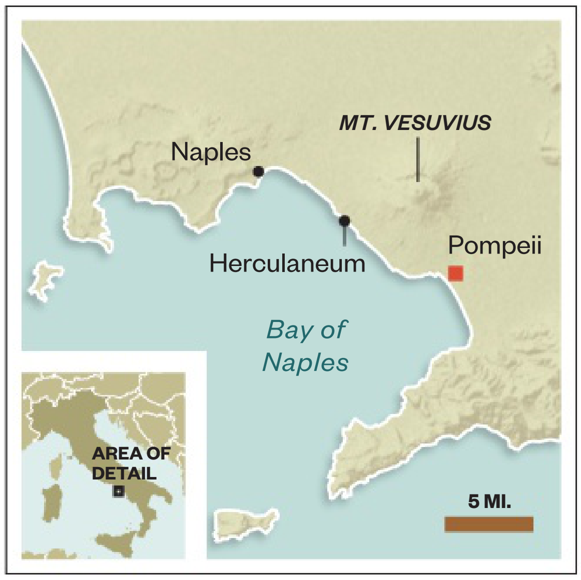
* * *

OSANNA LAUGHS SOFTLY at the mention of a rumor he spread to combat theft at the site, where visitors regularly attempt to make off with souvenirs. "I told a newspaper about the curse on objects stolen from Pompeii," he says. Since then, Osanna has received hundreds of purloined bricks, fresco fragments and bits of painted plaster in packages from across the world. Many were accompanied by letters of apology claiming that the mementos had brought bad luck. A repentant South American wrote that after he pinched a stone, his family "had nothing but trouble." An Englishwoman whose parents had pocketed a roof tile while on their honeymoon returned it with a note: "All through my childhood this piece was showcased at my home. Now that they are both dead, I want to give it back. Please, don't judge my mother and father. They were children of their generation."

Osanna smiles. "From the point of view of tourist psychology," he says, "her letter is an incredible treasure."

The smallish, roundish Osanna wears a suede jacket, a trim Vandyke beard and an air of becoming modesty. He looks faintly out of place in his office at the University of Naples, seated behind a desk and surrounded by computer monitors, with only the high-rises of the city in view and not a trace of rubble anywhere. On his desk is *Pompeianarum Antiquitatum Historia*, by Giuseppe Fiorelli, the archaeologist who took charge of the excavations in 1860. It was Fiorelli, Osanna tells me, who had liquid plaster poured into the cavities left in the volcanic ash by bodies that had long since rotted away. Once the plaster had set, workers chipped away at the encasing layers of ash, pumice and debris to remove the casts, revealing the posture, dimensions and facial expressions of Pompeiians in their final moments. To Osanna, the results—tragic figures caught writhing or gasping for breath with their hands covering their mouths—are grim reminders of the precariousness of human existence.

Osanna himself grew up near the extinct volcano Monte Vulture in the southern Italian hill town of Venosa, birthplace of the lyric poet Horace. According to local legend, Venosa was founded by the Greek hero Diomedes, King of Argos, who dedicated the city to the goddess Aphrodite (Venus to the Romans) to appease her after the defeat of her beloved Troy. The Romans wrenched the town from the Samnites in 291 B.C. and made it a colony.



As a child, Osanna frolicked in the ruins. "I was 7 when I found a skull in the necropolis under the medieval church in the center of town," he recalls. "That emotional moment was when I fell in love with archaeology." At 14, his stepfather took him to Pompeii. Osanna remembers feeling thunderstruck. He came under the spell of the ancient city. "Still, I never imagined I would someday be involved in its excavation," he says.

He went on to earn two doctoral degrees (one in archaeology, the other in Greek mythology); study the second-century Greek geographer and travel writer Pausanias; teach at universities in France, Germany and Spain; and oversee the ministry of archaeological heritage for Basilicata, a region of southern Italy famous for its shrines and churches dating from antiquity to medieval times, and its 9,000-year-old cave dwellings. "Near the Bradano River is the Tavole Palatine, a temple dedicated to the Greek goddess Hera," Osanna says. "Given that it was built in the late sixth century B.C., the structure is very well preserved."

> "BY FLAUNTING KNOWLEDGE OF THE MYTHS, THE HOMEOWNER COULD HAVE BEEN TRYING TO ELEVATE HIS SOCIAL STATUS."

›

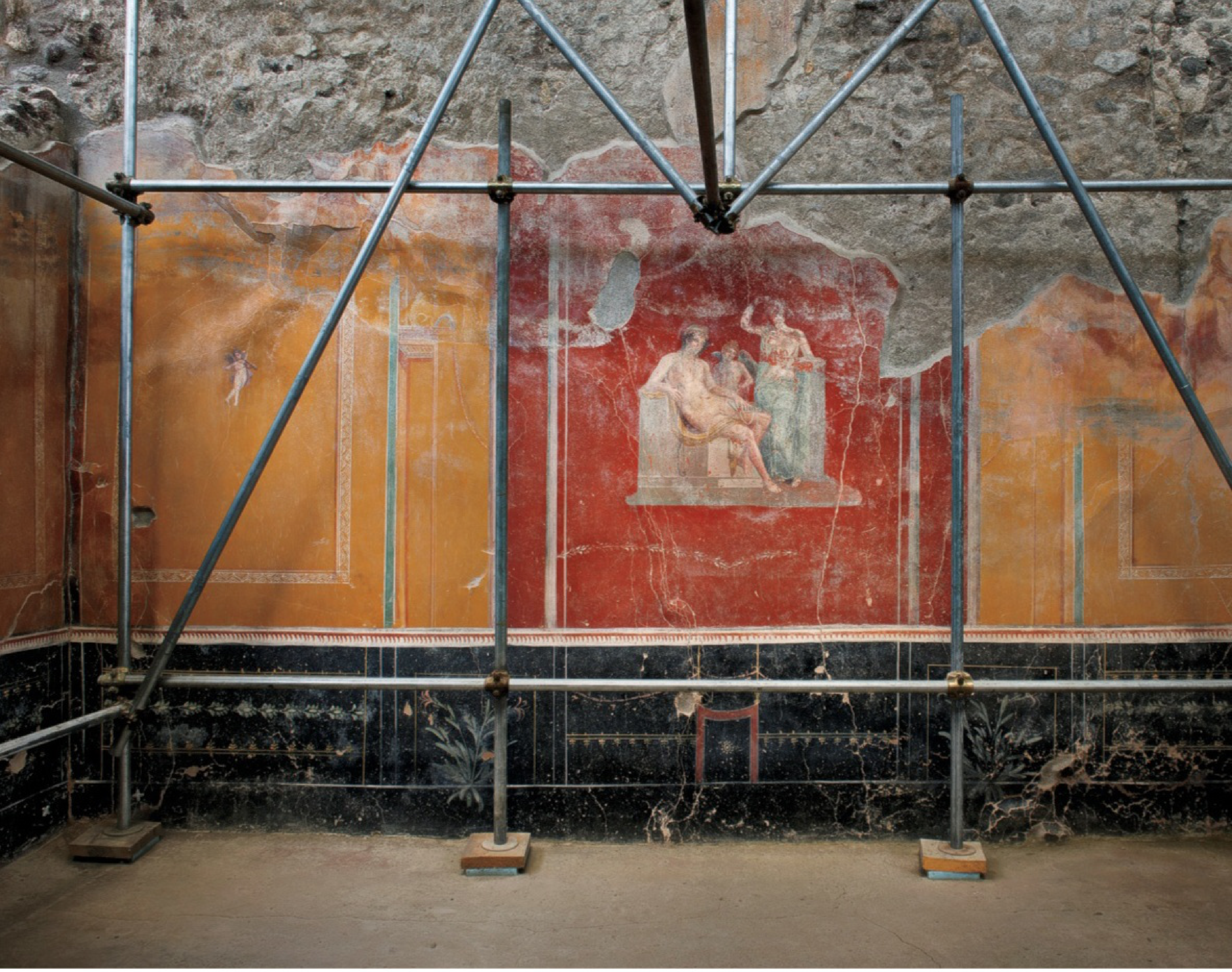
A 13- by 18-inch fresco, also newly uncovered, of Leda, raped by Jupiter in a swan guise, was built up from as many as six or seven layers of plaster under pigments.

MAP: GUILBERT GATES

REG·V·INS·VI

REG·V·INS·I
GRANDE PROGETTO POMPEI

Still off-limits, Regio V will someday be opened to visitors. One-third of Pompeii's 170 acres remain buried and not studied by modern researchers.



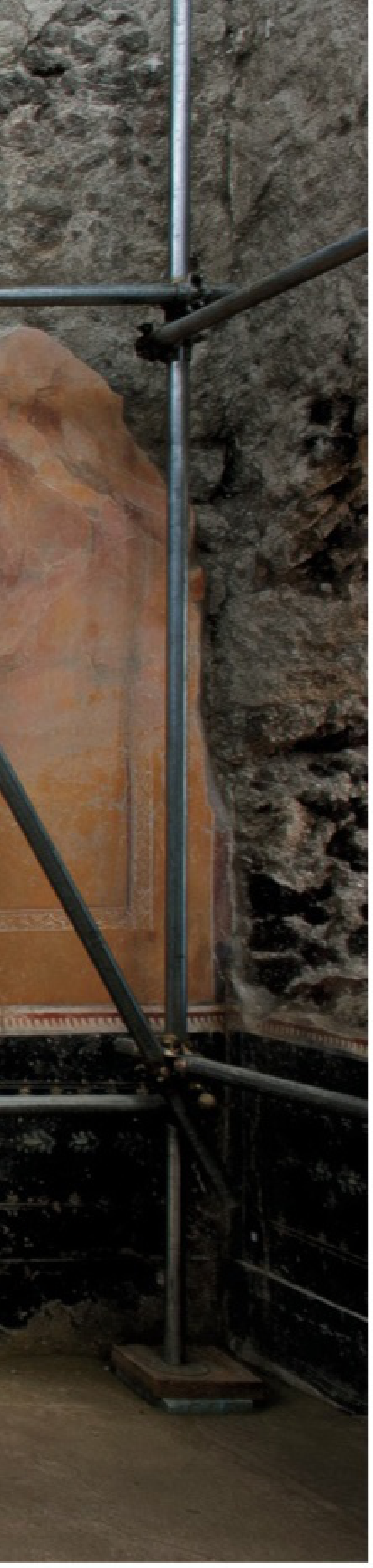
A recently exposed fresco shows Adonis, a Greek, with Venus, a Roman goddess. Mythology reflects political reality: Victorious Rome adopted Greek culture.

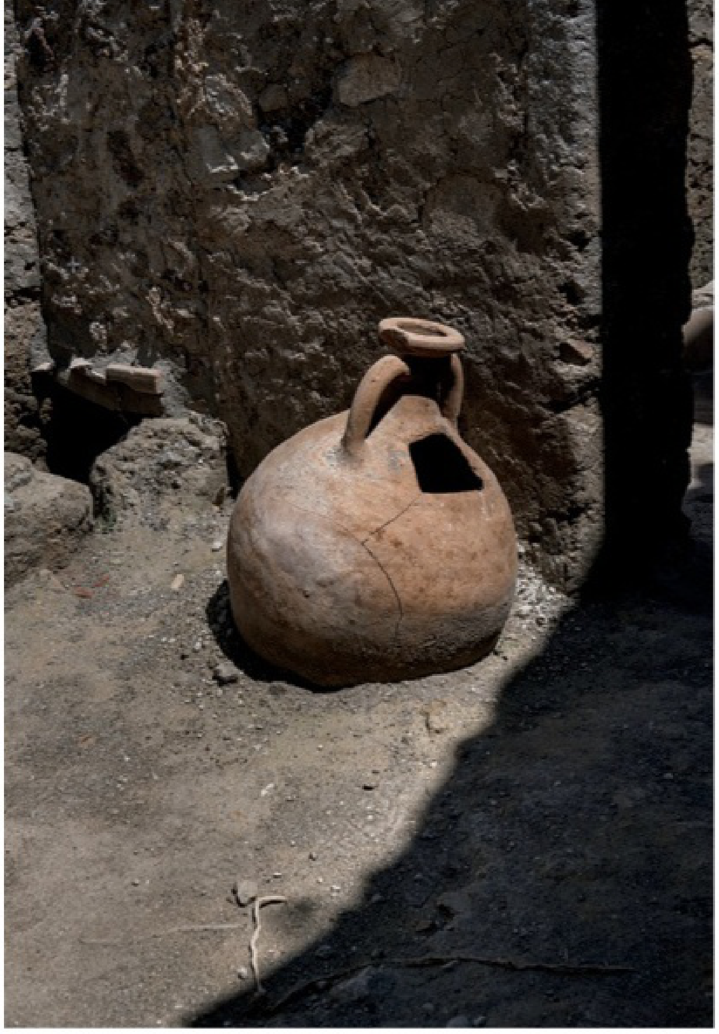
Pompeii wasn't so lucky. Today's archaeological park is largely a rebuild of a rebuild. And no one in its long history rebuilt more than Amedeo Maiuri, a human dynamo, who, as superintendent from 1924 to 1961, directed digs during some of Italy's most trying times. (During World War II, the Allied aerial assault of 1943—more than 160 bombs dropped—demolished the site's gallery and some of its most celebrated monuments. Over the years, 96 unexploded bombs have been found and inactivated; a few more are likely to be uncovered in areas not yet excavated.) Maiuri created what was effectively an open-air museum and hired a staff of specialists to continuously watch over the grounds. "He wanted to excavate everywhere," says Osanna. "Unfortunately, his era was very poorly documented. It is very difficult to understand if an object came from one house or another. What a pity: His excavations made very important discoveries, but were carried out with inadequate instruments, using inaccurate procedures."

After Maiuri retired, the impetus to excavate went with him.

▪▪▪▪

WHEN OSANNA TOOK OVER, the Italian government had slashed spending on culture to the point where ancient Pompeii was falling down faster than it could be repaired. Though the site generated more tourist revenue than any monument in Italy except the Colosseum, so little attention had been paid to day-to-day upkeep that in 2008 Silvio Berlusconi, then prime minister, declared a state of emergency at Pompeii and, to stave off its disintegration, appointed Marcello Fiori as the new special commissioner. It didn't take long for the restorer to disintegrate, too. In 2013, Fiori was indicted after he allegedly awarded building contracts inflated by as much as 400 percent; spent $126,000 of taxpayers' money on an adoption scheme for the 55 feral dogs wandering forlornly amid the ruins (about $2,300 per stray); $67,000 on 1,000 promotional bottles of wine—enough to pay the annual salary of a badly needed additional archaeologist; $9.8 million in a rush job to repair seating at the city's amphitheater, altering its historical integrity by cementing over the





A remarkably intact terra-cotta amphora found in Regio V's House of the Garden would have held wine, olive oil or dried fruit.

In addition to stabilizing structures, archaeologists install extensive drainage to divert destructive rainwater.

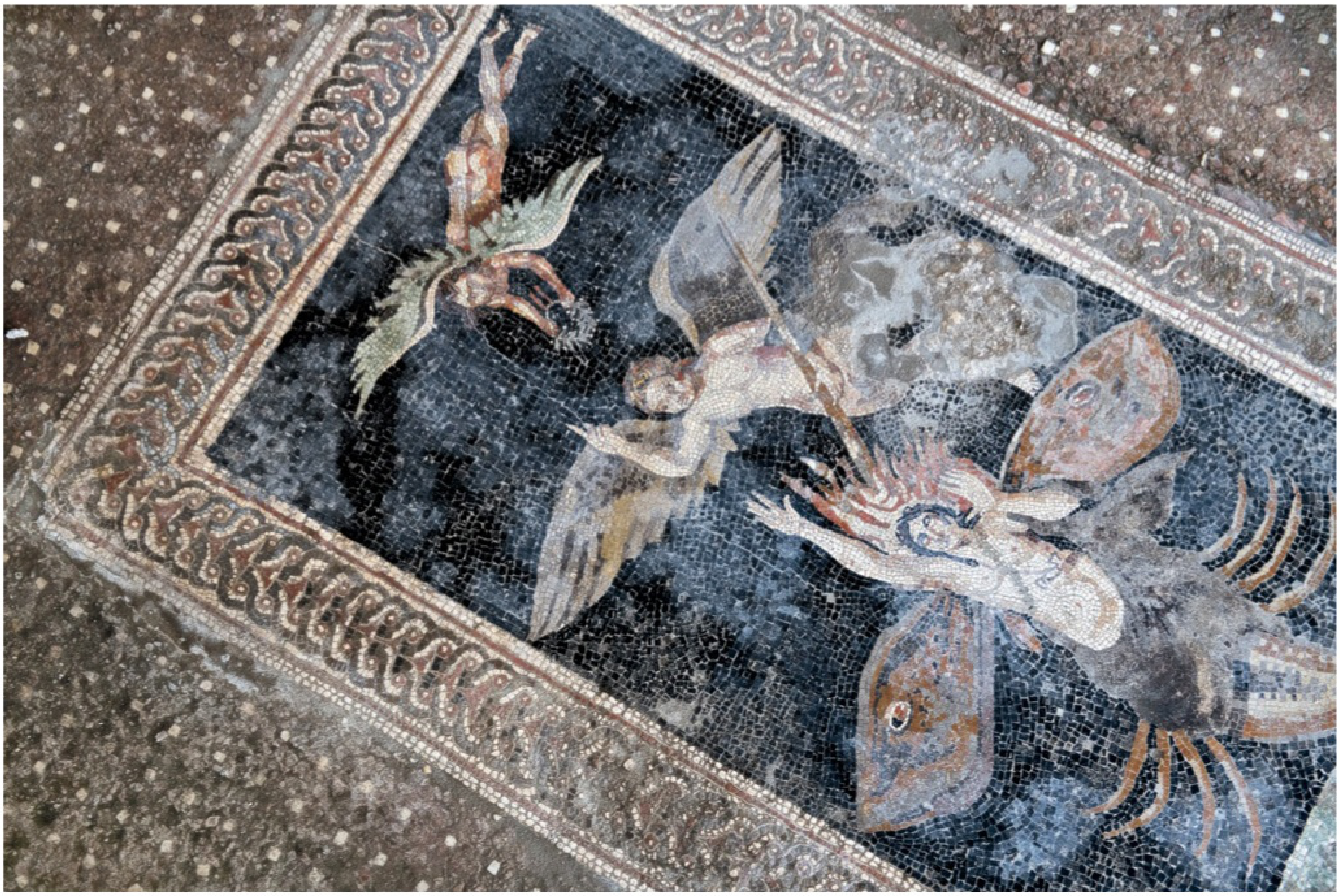
original stones; and $13,000 to publish 50 copies of a book on Fiori's *extraordinary* accomplishments.

Osanna took the job somewhat reluctantly. The archaeological site was beset by labor strife, work crews had been infiltrated by the powerful Naples Camorra mafia, buildings were crumbling at an alarming rate. To revive interest in the place and its history, Osanna mounted a popular exhibition focused on victims of the eruption, preserved in plaster. He gave visitors the opportunity to explore the site by moonlight, with guided tours, video installations and wine tastings based on an ancient Roman recipe. "It's always difficult to change the culture," he says. "You can achieve change, I think, step by step."

Having spent much of his first three years safeguarding what had already been uncovered, Osanna began to probe an untouched wedge of land in Regio V, considered the last great explorable section of the city. While bolstering the fragile walls, his team was soon disabused of the notion that Pompeii was preserved completely intact there. "We found traces of digs going back to the 1700s," he says. "We also found a more contemporary tunnel that extended for more than 600 feet and ended in one of the villas. Evidently, tomb raiders got there first."

The new excavation—which has also put a stop to looting—has opened a window on early post-Hellenistic culture. The entrance hall of one elegant home features the welcoming image of the fertility god Priapus, weighing his prodigious *membrum virile* on a scale like a prize-winning zucchini. Dominating a wall of the atrium is a stunning fresco of the hunter Narcissus leaning languidly on a block of stone while contemplating his reflection in a pool of water.

Embellished with a tracery of garlands, cherubs and grotesques, the bedroom of the same house contains a small, exquisite painting depicting the eroticized myth of Leda and the Swan. Half-nude, with dark eyes that seem to follow the observer, the Spartan queen is shown in flagrante with Jupiter disguised as a swan. The king of the gods is perched on Leda's lap, claws sunk into her thighs, neck curled



“WE CAN NOW OBTAIN INFORMATION THAT WAS ONCE IMPOSSIBLE TO GET. THIS IS **THE REAL REVOLUTION.**”

beneath her chin. Osanna says the explicit fresco is “exceptional and unique for its decisively sensual iconography.” He speculates that the owner of the house was a wealthy merchant, perhaps a former slave, who displayed the image in an attempt to ingratiate himself with the local aristocracy. “By flaunting his knowledge of the myths of high culture,” he says, “the homeowner could have been trying to elevate his social status.”

One floor design found in the House of Jupiter stumped archaeologists: A mosaic showing a winged half-man, half-scorpion with hair ablaze, suspended over a coiled snake. “As far as we knew, the figure was unknown to classical iconography,” says Osanna. Eventually he identified the character as the hunter Orion, son of the sea god Neptune, during his transformation into a constellation. “There is a version of the myth in which Orion announces he will kill every animal on Earth,” Osanna explains. “The angered goddess Gaia sends a scorpion to kill him, but Jupiter, god of sky and thunder, gives Orion wings and, like a butterfly leaving the chrysalis, he rises above Earth—represented by the snake—into the firmament, metamorphosing into a constellation.”

Roman religious practices were evident at a villa called the House of the Enchanted Garden, where a shrine to the household gods—or *lararium*—is embedded in a chamber with a raised pool and sumptuous ornamentation. Beneath the shrine was a painting of two large snakes slithering toward an altar that held offerings of eggs and a pine cone. The blood-red walls of the garden were festooned with drawings of fanciful creatures—a wolf, a bear, an eagle, a gazelle, a crocodile. “Never before have we found such complex decoration within a space dedicated to worship inside a house,” marvels Osanna.

One of the first really sensational discoveries was the skeleton of a man who at first seemed to have been decapitated by a massive flying slab of rock as he fled the eruption. The rock jutted out of the ground at an angle, with the man’s torso protruding and intact from the chest down, like some Romanic Wile E. Coyote. Man and rock were found at a crossroads near the first floor of a building, slightly above a thick layer of volcanic lapilli. Rather than having been beheaded, however, the 30-something fugitive

^ Discovered only last year, a floor mosaic of Orion turning into a constellation hints at the influence of Egypt, where the study of astronomy was revered.

> In the exceptionally luxurious Casa di Leda, decorations on an atrium wall include a satyr and nymph associated with the cult of Dionysus.

may have taken refuge in his home in the hours after the initial explosion, leaving only when he thought the danger had passed. The archaeologists established that the man had an infected leg that caused him to limp, hampering his escape. “The stone block may have been a doorjamb catapulted by the force of the volcanic cloud,” says Osanna. “But it appears that the man was killed by the lethal gases of the disaster’s later stages.”

He and his team drew this conclusion from the missing arms, thorax and skull later found three feet below the body. Presumably, a tunnel dug during an 18th-century excavation of Pompeii had caved in, burying the open-mouthed skull—which has lots of teeth and only a few fractures. Beneath the skeleton lay a leather pouch containing an iron key, about 20 silver coins and two bronze coins. “If this is a house key, the man might have taken it with him, thinking there was the possibility to come back, no?”

▪▪▪▪

THE PARADOX OF POMPEII, of course, is that its very annihilation was its salvation, and that the volcanic violence created the enduring narrative of an entire town frozen in time, its inhabitants baking bread, shaking hands, making love. In 1816, this seeming contradiction inspired in Goethe “the painful thought that so much happiness had to be erased, in order to preserve such treasures.”

To preserve Pompeii’s first-century treasures and decipher a history related to the larger narrative of classical antiquity, Osanna has embraced 21st-century technology. “We must leave for the next generation documentation that is very rich in comparison to what previous excavators left to us,” he says. “We can now obtain information that was once impossible to get. This is the real revolution.” Satellites assess risks of flooding to the site today. Ground sensors collect data seismically, acoustically and electro-optically. Drones produce 3-D imaging of houses and document the dig’s progress. CAT scans sweep away old certainties by peering into Fiorelli’s thick plaster casts and drawing a clearer picture of victims and what happened to them. Laser scanning has shown, among other findings, that Pompeiians had excellent teeth thanks to a fiber-rich, low-sugar diet.

“Through DNA analysis we can learn age, sex, ethnicity and even disease,” Osanna says. One plaster figure long believed to be a man was revealed to be female. The famous “Muleteer,” a crouched male who appeared to be shielding his face from the fumes, turned out to have no arms. (Was he born without them? Were they hacked off? The plaster arms were apparently “sculptural improvements” added to the cast in the 20th century.) And Pompeii’s celebrated “Two Maidens” locked in a poignant embrace may, in fact, have been young male lovers. “They were not related,” says Osanna. “It’s a fair hypothesis.”

Determining family relationships will be a key objective of the genetic research. Another: assessing the diversity of Pompeii’s population. “With all the talk about ethnic purity, it’s important to understand how mixed we are,” says Osanna. “This sense of proximity to our time is critical.”

Pompeii now seems more secure than it has since

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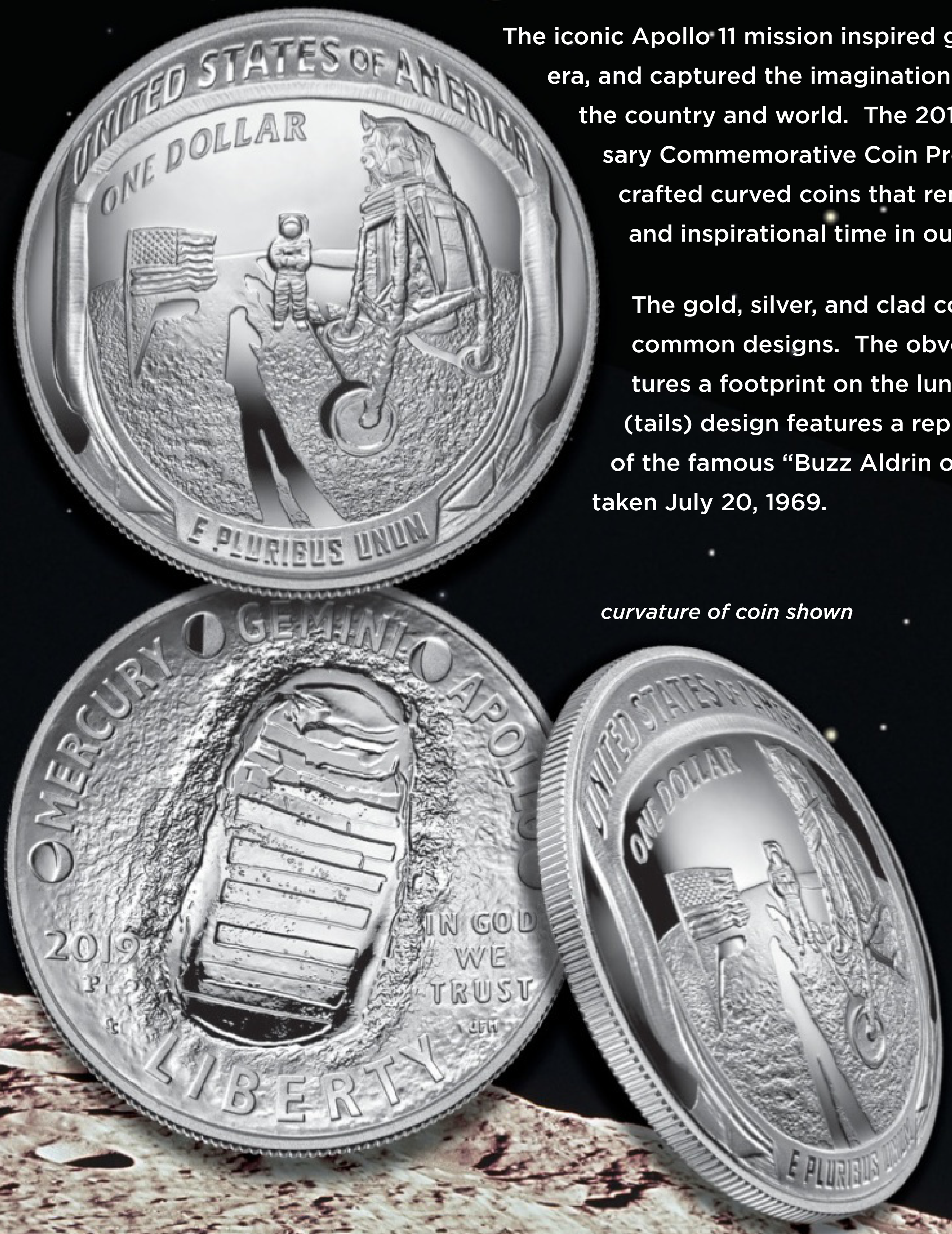

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Saturn’s Rings

CONTINUED FROM PAGE 55

Halfway through the A-levels—the two years of courses required to enter a British university—he dropped out and enrolled in vocational school. He apprenticed at a factory that was building circuit boards for elevator drives. To protect against static electricity, at times he had to work in a metal cage. “And that’s what my future career would be,” he said. “To stay in a cage and repair circuit boards forever.” He left and took a job at a warehouse, unloading 40-foot containers. He worked in the fridge at a dairy and ended up living in a small studio apartment with no heat and a ceiling he remembers as “illegally thin.”

On his 21st birthday, O’Donoghue and some pals decided to celebrate in Aberystwyth, a university town on the west coast of Wales. It was “freshers week,” the start of the school year. “Everyone was so friendly,” he said. “It was the best time I’d had in my life.” The next day, he went online to figure out how to enroll at the University of Wales, Aberystwyth. As it happened, a program in planetary and space science was looking for students with unconventional backgrounds—older students like O’Donoghue.

At Aberystwyth, O’Donoghue discovered that he loved research, loved looking through the ten-inch telescopes on campus. He could control them remotely from his computer at home, pointing them at the shaded side of the moon, and stayed up late looking for meteor strikes. “I fell in love with that idea of just having a cup of tea and sitting in an observatory all night.”

He found himself doing that a few years later, once he gained admission to the astronomy graduate program at Leicester. Finishing his PhD, he went on to Boston University, where he collaborated with Luke Moore, of the Center for Space Physics. Moore helped O’Donoghue figure out just how much water the rings were losing: between 952 and 6,327 pounds per second. The middle of that range would be enough to fill an Olympic-size swimming pool every half-hour.

In 2017, O’Donoghue moved to Maryland to work at Goddard, right around the time the Cassini spacecraft took the first-ever direct measurements of material leaving Saturn’s rings. Cassini was equipped with a cosmic dust analyzer, which detected water ice in the area between Saturn’s rings and atmosphere. As the spacecraft flew through the rings at more than 75,000 miles per hour during an epic grand finale—22 dives through the 1,200-mile-wide gap between the planet and its innermost ring (D ring)—the cosmic dust analyzer detected the composition, speed, size and direction of the particles that came in contact with the instrument. Hsiang-Wen Hsu, a member of the Cassini cosmic dust analyzer team, found that the amount of water leaving the rings matched well with O’Donoghue and Moore’s numbers. The rings were indeed raining.

Saturn’s immediate neighbors—Jupiter, Uranus and Neptune—also have rings, but they’re dwarfed by Saturn’s in diameter, mass and brightness. “We don’t really understand why Saturn has this massive ring system and the other giant planets don’t,” said Moore. Indeed, researchers are now wondering if the other outer planets that don’t have giant rings today might have possessed them long ago but eventually lost them. That wholly new way of thinking about planetary evolution is just one of the more spectacular implications of O’Donoghue’s discovery. Another is that Saturn’s rings, the most beguiling feature in the solar system beyond Earth, may be as young as ten million years old—millions or even billions of years younger than previously believed. If the earliest common ancestors of apes and humans had been able to look at the night sky through modern telescopes, they might not have seen rings around Saturn.

NEXT STOP, TITAN

A new spacecraft will soon return to Saturn’s neighborhood—to hunt for clues about the origins of life

IN 2026, NASA WILL LAUNCH another mission to Saturn—this time, to study the planet’s largest moon, Titan. The Dragonfly spacecraft is set to arrive at Titan eight years later and operate like a drone, gliding over the moon’s rolling dunes and hydrocarbon lakes to analyze surface materials. Titan is the only planetary body in the solar system other than Earth with stable liquid on its surface and a dense atmosphere, filled with a rich array of organic compounds, including large amounts of methane. Dragonfly plans to spend more than two and a half years leapfrogging across Titan’s surface as it searches for clues that might reveal how life began on Earth—and whether it has ever existed on Titan. **–JAY BENNETT**

For more on the Dragonfly mission, visit **smithsonian.com/titan**

* * *

ON DECEMBER 17, 2018, NASA issued a press release about O’Donoghue and Moore’s new paper, incorporating the data from Cassini. With a swimming pool’s worth of material leaving the rings every 30 minutes, O’Donoghue and Moore estimated that the rings could be gone in about 300 million years (give or take). To make matters worse, the Cassini Orbiter also found that ring material was flowing into the atmosphere even more quickly at the planet’s equator—in more of a straight-line pattern, at a rate of 22,000 pounds or more per second. That is the high estimate, but if this is a constant depletion—and it is unclear if it is—combining the ring rain estimates

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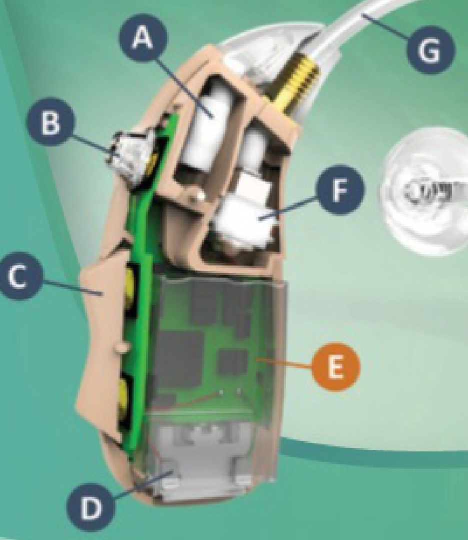

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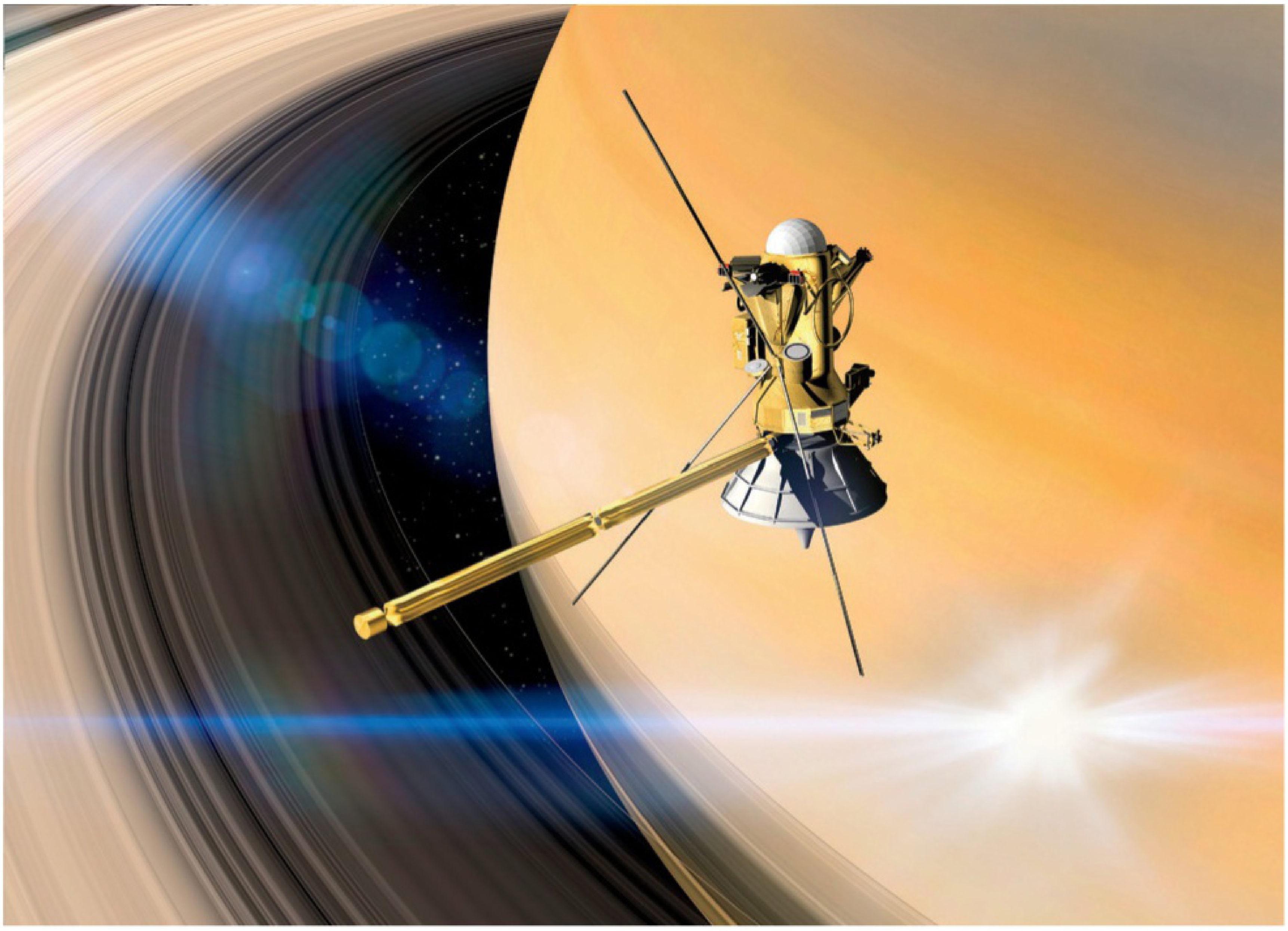

with the equatorial drain give the rings a future life span of less than 100 million years.

Coincidentally, the day NASA published the press release was also the first day of Saturnalia, an ancient festival in which Romans made sacrifices at the Temple of Saturn. A few days later, O'Donoghue said, he saw a video on YouTube, already with thousands of views, linking Saturn's ring rain to aliens, nuclear weapons, global warming, chemtrails and the Rothschilds. "It's like, wow! This escalated quickly," said O'Donoghue. "Take a Good Look at Saturn Before It's Too Late," *Time* magazine cheekily warned, "Because It's Losing Its Rings."

O'Donoghue thinks the ring revelations are awe-inspiring enough without resorting to hyperbole. He notes that studying other planets is a great way to learn about laws of nature we can't observe as easily on Earth. "They're like laboratories in space," he said. "Understanding the extreme interactions that go on elsewhere makes us check our physics on this planet." If we didn't realize till now that the single most iconic element in planetary astronomy is disappearing, then what else don't we know about the planets? What else don't we know about our own?

What's more, practical discoveries might come from a better understanding of magnetic fields—perhaps new advances in health care imaging that go far beyond magnetic resonance imaging, or developments on the scale of smartphones or solar panels. "It's just a huge lattice of information," said O'Donoghue. "You don't know how something will become relevant yet."

^ NASA's Cassini spacecraft, in a composite photo, passes between Saturn's atmosphere and rings before diving to its planned demise in 2017.

Still, it's hard to deny that humans are fascinated by Saturn for reasons that have nothing to do with practical discoveries. "I will argue that Saturn's rings are one of the most fantastic structures you can see in the solar system," said Hsiang-Wen Hsu, of the cosmic dust analyzer team. "Just as if you find a pyramid, it looks so grand, so spectacular. You want to know who built it and how it was built and why it was built. The same applies to Saturn's rings."

Earlier this year, O'Donoghue and his wife, Jordyn, moved to Tokyo so he could begin a fellowship at the Japan Aerospace Exploration Agency. In his spare time, he creates animated astronomy videos, which have more than two million views on YouTube. They show everything from the tilts and spins of planets to the actual time it takes for a ray of light to travel from the Sun to each planet. One of his animations is five and a half hours long. To O'Donoghue, just stimulating a sense of "Wow! Science!" is meaningful. "I think humans have always been explorers," he reflects. "Even if it was just for entertainment, it would be worth it." ◆

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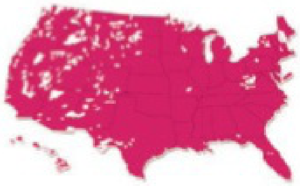

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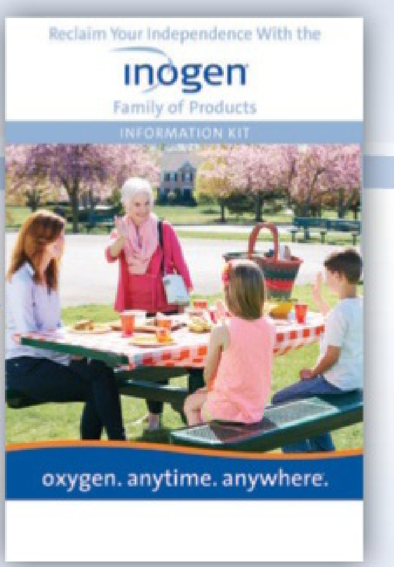

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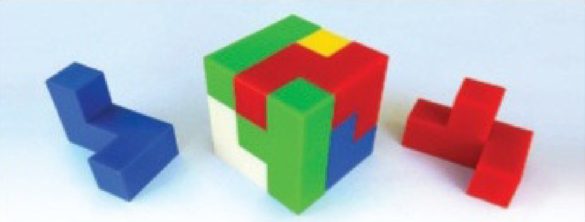

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The Western Flyer

CONTINUED FROM PAGE 37

the boat, as much as possible, but she has to take big seas again, and that requires a massive rebuild." Roughly 30 percent of the boat will stay original, including the galley, the bathroom, or head, and the berths where Steinbeck and the others slept. The remaining 70 percent of the boat is being replaced, and it has proved surprisingly difficult to find suitable wood.

The old-growth forests of Douglas fir, which blanketed most of the Pacific Northwest, and supplied the original beams, have nearly all been cut down, and the millions of new-growth Douglas fir trees are too young. "There aren't ten trees between here and Portland that I'd put in a boat," says Chase, referring to Portland, Oregon, 200 forested miles away. Instead, he has sourced Douglas fir and yellow cedar from Canada, white oak from Kentucky, and sustainably produced mahogany from Congo.

Vital to John Gregg's vision for the boat is a hybrid drive system with a rechargeable electric motor, a remotely operated underwater vehicle (ROV) housed on deck, and a laboratory in the old fish hold. These innovations will alter the balance and physics of the boat, and they've been criticized by purists, who want the *Flyer* to resemble its original self as closely as possible.

"This boat has an incredible magnetism," says Chase. "At least a thousand people have come here to see her, and some of them are true pilgrims. 'The book changed my life,' they say, and the boat is the living embodiment of that story. There was a guy from Sitka [Alaska] in his 80s who was shaking with emotion. 'I can't believe I'm walking on the deck of the *Western Flyer,'* he said. People have done séances here, and pinned photographs of Steinbeck to the boat, but I'd say nine out of ten people come here because of Ricketts, not Steinbeck."

Seven decades after his death at age 50 in 1948—the evening train from San Francisco smashed into his car on the railroad tracks in Monterey—Ed Ricketts remains a beloved figure, especially among marine biologists and people in Monterey. His fans call

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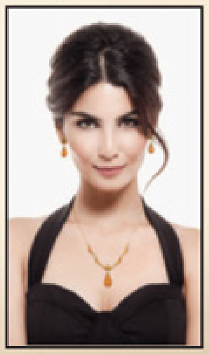

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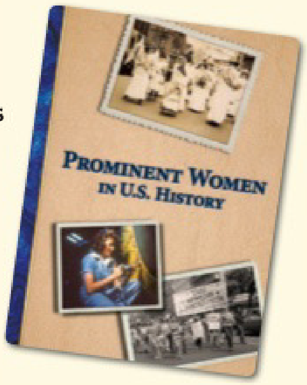

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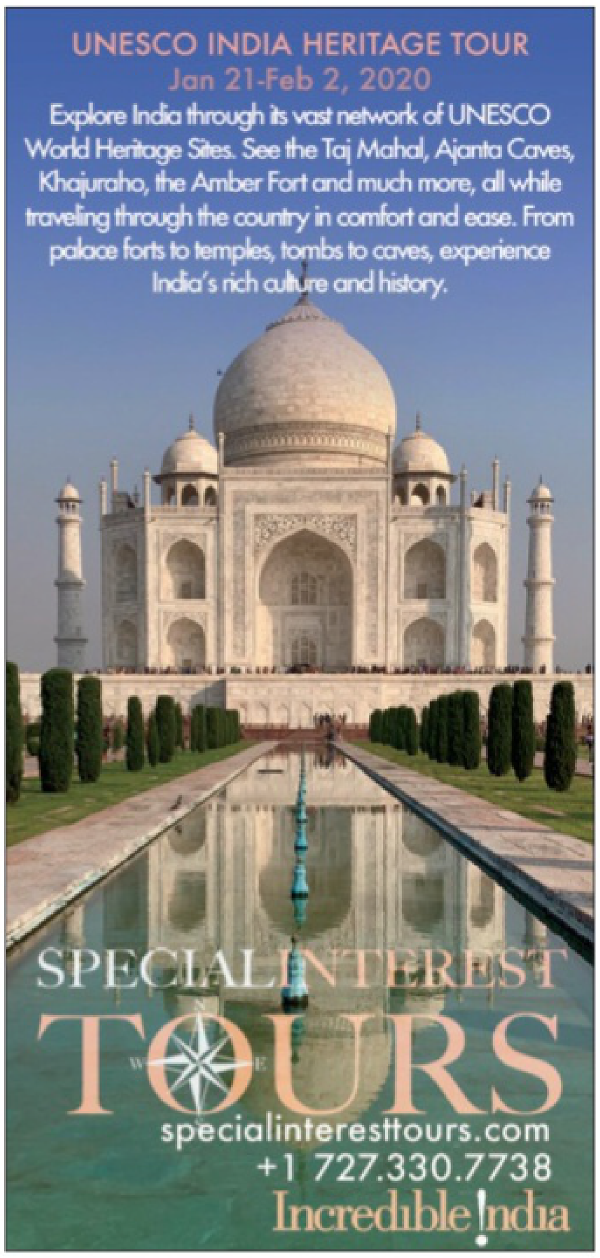

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themselves Ed Heads, and regard their hero as a free-spirited countercultural icon and ecological pioneer. Their vision of Ricketts is almost entirely drawn from Steinbeck's writings about him. "Every scientist needs a novelist to immortalize him," says Chase.

But Steinbeck's immortality as a novelist also owes a great deal to Ed Ricketts. He was the model for not only Doc in *Cannery Row,* but several other fictional characters, including Jim Casy, the preacher-turned-union organizer in *The Grapes of Wrath*. Ricketts' philosophical ideas were also important. Steinbeck always credited Ricketts as the co-author of the *Log from the Sea of Cortez*, and relied entirely on his notes from the expedition, having taken none of his own. When Ricketts died, Steinbeck was living in New York. Devastated by the loss, he burned all the letters that Ricketts had sent him. Years afterward, Steinbeck said, "He aches me like a missing arm."

* * *

JOHN GREGG IS IN Baja California on a scouting mission. He wants to establish a scientific laboratory and southern terminus for the *Western Flyer* near the old French mining town of Santa Rosalía. "She'll spend 26 weeks a year based in Monterey," he says. "The city is putting in solar panels on the dock so the electric motor can charge its Tesla batteries. For the rest of the year, she'll go north to Sitka and south to here. There's a 70-mile stretch of water north of Santa Rosalía that's never had a proper biological transect. That's real science the *Flyer* can do."

Doing real science is how Gregg hopes to inspire the students on the boat. "We'll invite the older kids from under-resourced community colleges," he said. "They don't get to do any real research, they don't have access to boats, and I like working with them. Out of a hundred, you might inspire six to do ocean science, and that would be great."

Accompanying Gregg on this trip is the Stanford marine biologist William Gilly. A shambling bear of a man, he probably knows more about squid than anyone else alive, and has worked extensively in the Sea of Cortez. He has

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arranged for a Mexican fishing boat, or *panga*, to take us out into that 70-mile stretch of water.

We climb aboard in the gray light before dawn, and thump and bounce our way north as the sun comes up. Dolphins arc through the water. Squadrons of pelicans glide past. We pass the occasional tattered shack on the volcanic shores, and it's easy to imagine the same salty air brushing across the sun-weathered faces of Steinbeck and Ricketts eight decades ago. Pausing to look at a school of brightly colored triggerfish, then hundreds of angelfish, Gilly says, "This is still a rich area, but there are no more big squid, so no more sperm whales. We think it's because the water is warming at depth."

The world's oceans are in declining health because of warming temperatures, increasing acidification, overfishing, plastic accumulation and industrial and agricultural pollution. Gregg is concerned that these processes are looked at haphazardly. "We don't have a good overall picture, just indications from a hodgepodge of studies," he says. "We need to develop a systematic approach for measuring acidification along the Pacific coast, for example, then the *Flyer* can help with long-term monitoring."

Chugging up an estuary, with ibis stalking the shallows and kingfishers on the banks, Gilly wonders if it's the same one that Steinbeck mentions in *The Log*. We get out of the boat and Gregg points out the tracks of a bobcat and her kitten in the sand. It's an exceptionally peaceful place and it makes us talk in soft quiet voices. "The essence of the *Western Flyer* project is the essence of the book," says Gregg. "It's the merging of art and science. I always resented the fact that I was pushed over into the science camp, when I was just as interested in art and literature."

The resurrected *Western Flyer* will be a scientific vessel, but Gregg wants to have writers and artists involved as well, to ensure that a sense of wonder and beauty is retained. "For so long, it was a faraway dream," he says. "Now it's really happening and it's a complete honor. This sounds trite, but with the *Flyer*, you're just a caretaker, not an owner. She'll be going long after I'm gone." ◆

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ask smithsonian

YOU'VE GOT QUESTIONS. WE'VE GOT EXPERTS

Q: You can waste a lot of time watching internet videos of goats jumping. But how common is that four-legged behavior in real life?

Chase Carter | Washington, D.C.

IT'S AS COMMON as it is cute, says Craig Saffoe, curator of the Great Cats, Andean bears and Kids' Farm areas at the National Zoo. Goats' natural inclination is to jump and climb wherever their hoofs take them. Domesticated goats are incredibly sure-footed, probably a taxonomic evolutionary trait from when they lived in mountains. Just as with people, the kids tend to be more playful and jumpy than the grown-ups.

Q: What are the largest denominations of U.S. currency ever issued?

Anonymous

THAT'S THE $100,000 question (and answer). In 1934, the federal government printed gold certificates in that amount, but the notes were only for use within the Federal Reserve System—not by private citizens, says Ellen Feingold, curator at the National Numismatic Collection. The largest denomination ever circulated as legal tender was the $10,000 bill. Before widespread access to banking systems and credit, it was used for big purchases like property. But it also became a target for counterfeiters and criminal enterprises hoping to keep large, illicit purchases anonymous. The Treasury and the Federal Reserve discontinued the note in 1969.

Submit your queries at Smithsonian.com/ask

Q: Is climate change driving human migration from Central America?

Betty Wood | Honolulu

MANY MIGRANTS to Mexico and the United States are originally from countries in the Central American Dry Corridor, such as Honduras, El Salvador and Guatemala. This area has an intrinsically variable climate that alternates between flooding and drought, explains Scott Wing, research geologist and curator of paleobotany at the National Museum of Natural History. It is likely that climate change is making the rainfall even less regular and the temperatures even more extreme. As a result, rural farmers are struggling to grow their crops and food insecurity is spreading. Some migrants first try to find work in their nations' cities but frequently encounter high rates of crime and poverty, so they continue their migration north.

Q: I've heard that the author William Faulkner had a great-grandfather who was a Confederate colonel in the Civil War (and something of a local legend). Can the family line be documented?

Jean W. Hanson | Avon, Ohio

THAT'S RIGHT, says Nancy Bercaw, curator at the National Museum of American History's Division of Political and Military History. William C. Falkner, who spelled his last name without the "u," was born in Tennessee in 1825 (or 1826) and supported the South during the Civil War. At the time, officers for the Confederacy generally had to be elected and Falkner lost his position as colonel in the second year of the war. Furious, he resigned and joined his local militia. After the South lost, he dedicated himself to spreading the myth of the "Lost Cause" and exaggerated his own record. It worked: A memorial was constructed in Ripley, Mississippi, in his honor and his great-grandson grew up to idolize him, even writing characters based on him into some of his books. ◆

Text by Anna Diamond

Illustration by **Eugenia Mello**

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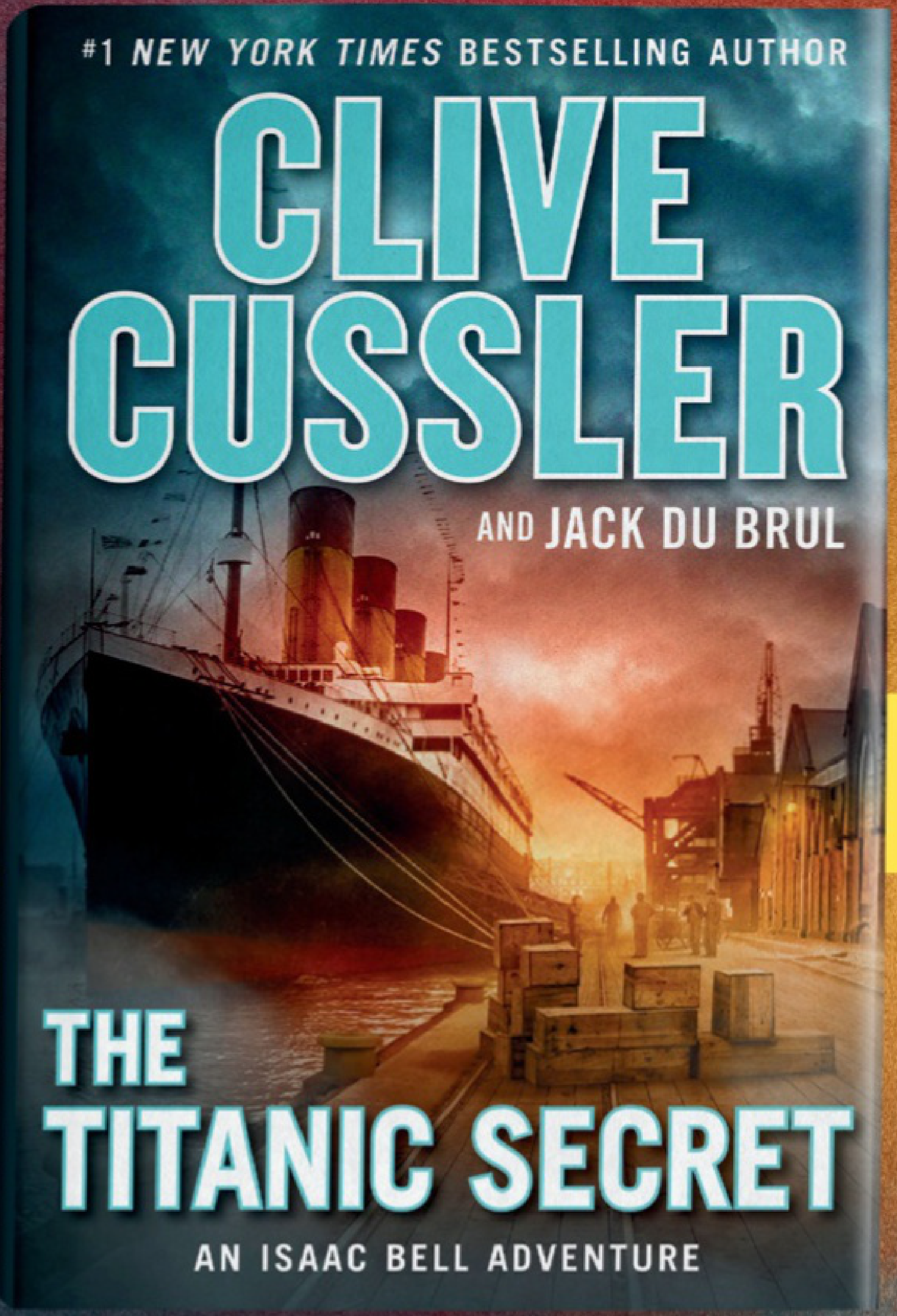
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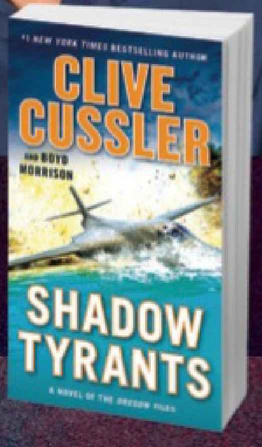
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